BENCHMARKING EVALUATION OF DAO STEWARDSHIP PROGRAMS IN ALBERTA

FINAL REPORT

Report Commissioned by Alberta Environment

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1 EXECUTIVE SUMMARY

1 EXECUTIVE SUMMARY

Alberta Environment manages the use of Alberta's diverse landscapes to sustain a healthy environment, a prosperous economy and strong communities. Alberta is committed to protecting the province's air, land, and water while striving to be a leader stewarding the environment. To support this goal, Alberta Environment engaged BearingPoint to conduct a benchmarking evaluation of Alberta's DAO Stewardship Programs versus comparable programs in other jurisdictions. The review focuses on three programs:

- Non-milk beverage containers (managed by the Beverage Container Management Board—BCMB),
- Scrap tires (managed by the Alberta Recycling Management Authority, Tire Recycling Alberta—TRA), and,
- Waste electronics (managed by Alberta Recycling Management Authority, Electronics Recycling Alberta—ERA).

The information is required as a basis to inform policy and program decisions for improving the environmental outcomes of the programs in a cost effective manner, while maintaining a high level of public confidence.

The key objective for this evaluation and related analysis is to benchmark Alberta Environment's effectiveness and cost-effectiveness with programs in other jurisdictions. Effectiveness focuses on the achievement of specific objectives while cost effectiveness focuses on the relationship of cost and effectiveness (cost per incremental unit of achievement of objectives or effectiveness) in comparison to programs or approaches to waste stewardship that are carried out in other provincial/state/national/international jurisdictions.

* * *

Beverage Container Recycling Program

Alberta's beverage container recycling program is mature and very effective—but has plateaued.

Alberta has one of the broadest program scopes in North America and Europe, driving significant diversion of beverage containers from the Alberta waste stream. Few other programs include "non traditional" products in their scope that typically have far lower recovery rates—most programs focus strictly on beer and non-beer aluminium, plastic and glass containers.

Recoveries in Alberta are comparable to all other jurisdictions with similar structures and are far superior to jurisdictions with non-deposit programs. Alberta's overall recovery is approximately 80% and typically only marginal points behind the leader of any container category. Virtually all of Alberta's beverage containers are recycled or re-used in what is essentially a closed loop system.

Alberta's beverage container recycling program costs are competitive to comparable jurisdictions with the highest recoveries. Transportation and processing costs compare very favourably to other jurisdictions despite duplication created by two recycling streams—beer and non-beer. Alberta handling commissions are an issue as they offset these transportation and processing efficiencies. Handling commissions in bottle depots, driven by average labour rates approaching $15 per hour for handling waste beverage containers, are generating a significant financial burden on the overall system.

There is an interesting comparison of different program structures between Alberta and Ontario. Ontario's program is based on a municipal Blue Box program (with a very broad scope) with no deposits on containers, and with program costs shared between municipalities and industry. Taking non-beer beverage containers in isolation, Ontario's recoveries are about half of Alberta's (40% versus 75%), but Ontario's program costs are less than a third of Alberta's ($0.017 versus $0.058) on a unit recycled cost basis. The cost benefit analysis of the comparison of these two programs is a matter of public policy along with provincial and municipal environmental stewardship strategy.

Alberta recovery rates are excellent and compare to those in leading jurisdictions, but they have plateaued during the past seven years. Alberta should consider increasing and potentially harmonizing deposit rates (including adjusting recycling levies) to drive increased recoveries, adding milk containers to broaden the program scope, implementing technology based innovations to increase efficiencies in the collection stream, and focusing marketing efforts on increasing consumer awareness for categories such as tetra packs, gable tops, as well as aluminium cans. Other jurisdictions—California and Saskatchewan—have increased their recoveries in their previously plateaued programs primarily through increasing deposit rates with success.

Finally, while the current structure is sound and generates excellent results compared to other programs, there is an inherent conflict when funding the beverage container recycling program through unredeemed deposits and recycling fees or levies. This structure creates an incentive for industry to minimize recovery rates to avoid higher recycling levies that would increase to the total purchase price of beverages.

Scrap Tire Recycling Program

Alberta's scrap tire program is effective but high cost—the policy to not burn tires and to invest in research and development for alternative uses creates significant cost impacts.

Scrap tires as a component of the waste stream are typically benign and individually have little environmental impact other than the space required to manage them and the resources wasted by not recycling the materials. When stored in volume, the potential risk becomes exponential with tire fires being a primary concern. Stockpiles are also excellent artificial breeding habitats for disease carrying insects (i.e. West Nile Virus).

The Alberta program scope encompasses passenger, light truck and commercial tires; and excludes off-road tires that are typically larger construction and mining equipment tires. Virtually all programs have comparable scopes, as few handle problematic off road tires due to the infrastructure required—off road tires tend to be exceptionally large, heavy and difficult to handle. Alberta's recoveries are exceptionally high and comparable to leading jurisdictions with similar program scopes. Most of these tire programs are mature and recycle virtually every tire sold, reporting recoveries approaching 100%.

Alberta's overall program costs are higher than most comparable programs. Despite this, the actual collection, transportation and process costs—incentives paid—ranged between $2.62 and $2.92 per tire, and these are comparable to most other jurisdictions. Two key policies drive Alberta's program costs higher than others:

Most jurisdictions elect to burn tires and report acceptable environment stewardship outcomes. Alberta's policy to not burn tires results in the subsidization of alternative end use products—all more expensive than burning. Alberta's end uses for tires include civil engineering products (e.g. shred lining for landfills, asphalt, etc) and manufactured products (e.g. mats, bricks flooring, etc). This policy makes Alberta's program more expensive than most other programs thus Alberta may want to revisit this policy. An important consideration is that crumb rubber is an alternative fuel source

commodity that is influenced by the price of traditional fuel sources—the rising price of oil, gas and coal typically increases the value of scrap tires as a fuel source.

In addition, Alberta has committed to fund research and development into alternative end uses for scrap tires. Over 40% of the Alberta program revenues over the past three years have been expended on research and development for alternative end uses for tires along with program marketing (public education). Few other jurisdictions allocate funds for comparable research and development, thus Alberta is essentially "going it alone" and has generated minimal results to date. The policy question is who should conduct research and development, and how should it be conducted and funded? Alternative models for research and development should be considered involving both industry and stakeholders in other jurisdictions nationally and internationally.

Alberta should consider burning all categories of tires while continuing to support alternative end use products, developing end of life solutions for these end use products ensuring a closed loop system, broadening the program scope to include off road tires, and devising an alternative research and development strategy for end uses for scrap tires incorporating manufacturers along with other stakeholders to more effectively and equitably pursue long term solutions.

Waste Electronics Recycling Program

Alberta's waste electronic recovery program is in its infancy—most European programs have much broader scopes driving efficiency and exponentially greater waste diversion.

Rapid technological advancement combined with declining product life cycles is creating a global proliferation of electronic products. Despite the drive towards miniaturization, the overall tonnage of electronics manufactured and sold throughout the world is ever increasing.

The resulting waste streams are creating issues both locally in Alberta, and across the world. Waste electronics consist primarily of metal and plastic; with much smaller amounts of glass, rubber, and a host of other materials including many toxins such as lead, mercury and freon. Total metals and plastics comprise approximately 12% of the current overall waste stream in Alberta. Scrap electronics contribute a portion of this tonnage, and the associated toxins create a significant environmental stewardship concern.

There are few formal electronics recycling programs actually implemented—there are only two others besides Alberta in North America with the balance being in Europe and Asia. Most other North American jurisdictions deal with electronics on a project basis (e.g. annual round-ups, etc) with larger metal-centric goods (e.g. appliances) being recycled haphazardly driven primarily by geography and commodity prices. Europe hasn't moved much faster—it appears that only six of the 25 European countries have actually implemented a program, with the balance of European countries still developing a program, despite a Europe wide directive to have a program in place in 2005.

Alberta's eWaste program's scope is comparable or better than the other North American programs in Delaware and California. Alberta has a much narrower program scope than the European programs—driving a much lower diversion of waste electronics from the Alberta waste stream. European programs include white goods (washers, dryers, etc), brown goods (smaller household appliances such as blenders, toasters, etc), power tools, gardening tools, toys, medical equipment and lighting (tubes and fixtures). Medical equipment and lighting are of particular interest given their propensity to contain toxins.

The good news is that Alberta's recoveries are higher in the program's first year of operation compared to the recovery results in the first year of operation for programs in the Netherlands and Switzerland. Mature European programs have recoveries upwards of 12 kg/capita—significantly higher than Alberta's .66 kg/capita. This is largely driven by the broader program scopes that include white and brown goods exponentially driving tonnage.

European programs reportedly recycle 70% to 90% of waste electronic component tonnage collected—Alberta reports similar results. Municipal collection sites, like those employed in Alberta, are the primary collection points for successful European programs. Return-to-retail collection tends to be a lower volume collection method and focused primarily on larger delivery oriented items (e.g. white goods). The number of collection sites appears to be a more important element in European programs—programs in larger countries have over 1000 collection sites versus Alberta's 120. Even small jurisdictions such as the Netherlands and Delaware (these jurisdictions are barely larger than the Capital Region in Alberta) have many more collection sites than Alberta.

Alberta's costs are difficult to measure given that the program is in its infancy and has incurred significant start-up costs. Geography and economies of scale do impact the costs of comparison programs. There appears to be a direct relationship between a jurisdiction's area (sq. kms) and the direct costs per kg—this relationship will invariably negatively impact Alberta costs given Alberta's large and sparsely populated area. Economies of scale (e.g. broader program scope dramatically increasing tonnage) also impact costs.

Alberta should consider broadening its program scope and including of other items and categories to increase tonnage (and waste diversion) while generating better efficiencies through economies of scale. White and brown goods, tools, toys, etc. would exponentially increase tonnage driving economies of scale and partially addressing the geographic barriers while incorporating medical equipment and lighting would address landfill toxins issues. Adding exponential tonnage will require significant infrastructure considerations and potentially investment throughout the system.

* * *

Overall Alberta Environmental Recycling Program Findings

Most programs in North America and Europe, including Alberta's, are managed independently—there may be opportunities for overall improvement through integration.

The three focus recycling programs—beverage containers, scrap tires and waste electronics—are managed within Alberta Environment regulations, but otherwise operate independently. Most European programs are industry driven within government regulation, but operate independently of each other as well given their extended producer responsibility approach to environmental stewardship. There may be opportunities to better align and potentially integrate these programs along with other independent stewardship programs such as municipal Blue Box programs, etc. into a broader environment stewardship strategic plan and governance structure driving greater overall waste diversion while achieving better overall efficiencies.

Extended Producer Responsibility (EPR) philosophies driving legislation and program structures need to be revisited.

North American and European jurisdictions legislating broader EPR actions than Alberta tend to structure programs comparable to Alberta's program to comply with local legislation at the lowest possible cost rather than fundamentally changing design, packaging, etc. to drive greater waste avoidance or diversion. The only significant difference

between industry and government driven programs tends to be the governance model (who appoints the directors), as the operational structures appear to be comparable.

EPR models in Canada such as the Provincial Blue Box program in Ontario are designed to ensure producers (manufacturers and the supply chain) have financial incentives to ultimately divert material from the waste stream and increase the re-use and recycling of materials. The flaw to date of EPR approaches appears that the financial incentives for driving waste diversion tend to be tremendously offset by sales and profitability drivers, thus mitigating their effect.

A significant negative attribute of industry driven programs is that program information tends to become proprietary thus limiting the transparency of programs—this is an issue specifically with beer container recycling programs throughout North America and with European recycling programs in general. The lack of information potentially mitigates overall regulatory control, the ability to develop good government environment stewardship policy, and continuous improvement initiatives.

Innovation appears best driven through the private sector.

Despite the shortcomings of many EPR initiatives, the most innovative processing and alternative end uses that are generating tremendous efficiencies to date have generally been driven by the private sector; through economic incentives built into the program structures created in each jurisdiction. For example, EPR oriented programs have generated significant financial efficiencies for beverage container recycling in Alberta (potentially the lower cost per unit program in the world for transportation and processing) despite dual beer and non-beer systems and an inefficient depot structure. Future program structures need to be designed to create optimal financial incentives for private sector innovation in avoiding and/or diverting waste in addition to driving cost efficiencies throughout the system.

Alberta environment stewardship policies need to be revisited.

To drive greater recoveries or to generate program efficiencies, several Alberta policies should be revisited including:

- Consolidation of beer and non-beer collection systems
- Increasing / harmonizing beverage container deposit rates
- Burning scrap tires
- Out-of-province processing of waste materials
- Use of "sheltered workshops"
- Scrap tire research and development investment strategy

Opportunities exist to broaden program scopes to increase waste diversion.

Broadening Alberta program scopes to include milk containers, off road tires, white/brown goods, tools, toys, medical equipment and lighting has the potential to generate greater recoveries and waste diversion, while simultaneously achieving greater program efficiencies through economies of scale in each of the programs.

2 INTRODUCTION

2 INTRODUCTION

BearingPoint was engaged by Alberta Environment to conduct a benchmarking evaluation of Alberta's DAO Stewardship Programs to comparable programs in other jurisdictions. The review focuses on three programs:

- Beverage containers,
- Scrap tires, and
- Waste electronics.

The information is required as a basis to inform policy and program decisions for improving the environmental outcomes of the programs in a cost effective manner, while maintaining a high level of public confidence.

2.1 PROJECT OBJECTIVES AND SCOPE OF WORK

The key objective for this evaluation and related analysis was to benchmark effectiveness and cost-effectiveness with programs in other jurisdictions. Effectiveness focused on the achievement of specific objectives while cost effectiveness focused on the relationship of cost and effectiveness (cost per incremental unit of achievement of objectives or effectiveness) in comparison to programs or approaches to waste stewardship that is carried out in other provincial/state/national/international jurisdictions.

2.2 KEY QUESTIONS TO BE ADDRESSED

There are five key questions that were required to be addressed through this initiative and are studied in detail within this report. They are:

- How does the overall effectiveness of Alberta's programs in terms of achieving mandated outcomes (i.e. material collection rates, etc.) compare with programs targeting those same materials in other jurisdictions?
- What are the financial costs attributable to achieving mandated outcomes of Alberta's programs and how does this compare (on a cost-effectiveness basis) with the programs in other jurisdictions?
- How do the Alberta programs compare with programs in other jurisdictions in terms of the disposition of collected materials (i.e. volumes and/or rates of collected materials that are re-used and recycled)?
- Are the most appropriate and efficient mechanisms being employed to achieve program objectives in Alberta?
- Are there examples of best practices or innovative approaches to waste stewardship that can be identified from this analysis that would be appropriate for consideration in Alberta?

2.3 PROJECT DELIVERABLES AND TIMELINES

This project was comprised of four phases with specific deliverables as follows:

Phase One—Benchmark Methodology, Data, Plan and Schedule

- Identification of the key outcomes of Alberta's programs that will be used as a basis for comparison of program effectiveness with other programs.
- Outline of the financial costs and methods for costing the Alberta programs in relation to outcomes achieved.
- Identification of programs in other jurisdictions that can be used for benchmarking effectiveness and cost-effectiveness with Alberta's programs.
- An outline of the characteristics, elements, variables and the jurisdictional context among the waste stewardship programs (Alberta's and other jurisdictions) that will be compiled to allow for the normalization of data and comparability of programs.
- A detailed Table of Contents for the entire scope of the project.
- A detailed project plan and schedule illustrating tasks and milestones with deliverable components to be produced by the tasks.
- Conduct a project status and next steps meeting with AENV staff to discuss information required by this deliverable.

Phase Two—Preliminary Report of Benchmarking Results

- Comparisons of the effectiveness of Alberta's programs (in achieving outcomes) with the outcomes achieved by programs of other jurisdictions targeting those same materials
- The status of any findings to date in relation to determining the financial costs of programs that will be used for cost-effectiveness comparisons between programs
- A presentation (PowerPoint) to selected AENV staff outlining and explaining the content and findings of the preliminary report.
- An updated project plan and schedule

Phase Three—Draft Report of Benchmarking Results

- A Draft Report of effectiveness and cost-effectiveness benchmarking comparisons of all three Alberta stewardship programs including: introduction, context, methodology, findings, results and conclusions that address all of the key questions as outlined in the objectives and scope section of this RFP. The report will include appropriate tables and graphs to demonstrate findings, results and comparisons of programs.

Phase Four—Final Report of Benchmarking Results

- A Final report.
- A presentation to selected AENV staff outlining and explaining the content, findings and conclusions of the report.

The following chapters and appendices present our findings, conclusions and recommendations for each of the three subject matter areas.

3 Overall Findings and Conclusions

3 OVERALL FINDINGS AND CONCLUSIONS

The key objective for this evaluation and related analysis is to benchmark Alberta Environment's effectiveness and cost-effectiveness with programs in other provincial/state/national/international jurisdictions. 'Effectiveness' focuses on achieving specific objectives while 'cost effectiveness' focuses on the cost per incremental unit of achieving those objectives.

3.1 BEVERAGE CONTAINERS

Beverage container recycling programs worldwide are typically mature and have been operating over a decade in western countries. Beverage container programs typically have three variables—governance, funding (including deposit levels) and recovery.

Governance models generally break into three models: delegated arrangement, governmental administrative agencies or producer responsibility organizations. Alberta and many other jurisdictions have adopted a delegated arrangement model. Each of the programs reviewed tended to operate in a similar manner regardless of the governance model—the principal differences tend to be the director reporting structures.

Funding structures tend to be more numerous and complex. Alberta's program is funded by a deposit and refund system that allows unredeemed deposits to fund a portion of the recycling program, non-refundable recycling levies, and revenues generated by the recycled commodity materials (aluminium, glass, plastic and paper).

Other programs incorporate deposit and half back systems (consumers receive half of the deposit upon returning a container), stewardship fees imposed on industry that are passed on to consumers, municipal taxation (typically costs of a Blue Box type programs, and escheats (unredeemed deposits and recycling) that may be used to fund beverage specific recycling programs or taken into general revenue effectively as taxation. The Alberta model is the predominant program structure in Canada. Similar deposit and refund systems are not widely deployed in the US or non-Nordic Europe.

Recovery mechanisms fall into two categories—deposit programs and non-deposit programs. Alberta's program is structured as a deposit program. These programs are predicated on a consumer incentive model whereby consumers are reimbursed a deposit upon returning an eligible container to a bottle depot or retail location (Alberta has a limited return to retail model for beer containers). Non-deposit programs embrace a consumer responsibility model where there are no deposits or reimbursements; consumers are encouraged to return containers either to municipal drop off sites or through curbside collections programs (e.g. Blue Box programs in Manitoba and Ontario).

There is an inherent conflict when funding the beverage container recycling program through unredeemed deposits and recycling fees or levies. Increasing recoveries will reduce unredeemed deposits, thus recycling fees would rise to offset funding shortfalls. Industry has generally resisted recycling fees, and would resist an increase in these fees due to perceived negative impacts on sales—thus there is a financial incentive for industry to not increase recoveries and maintain the current level of unredeemed deposits. Alternative structures mitigating the impact of this conflict should be investigated.

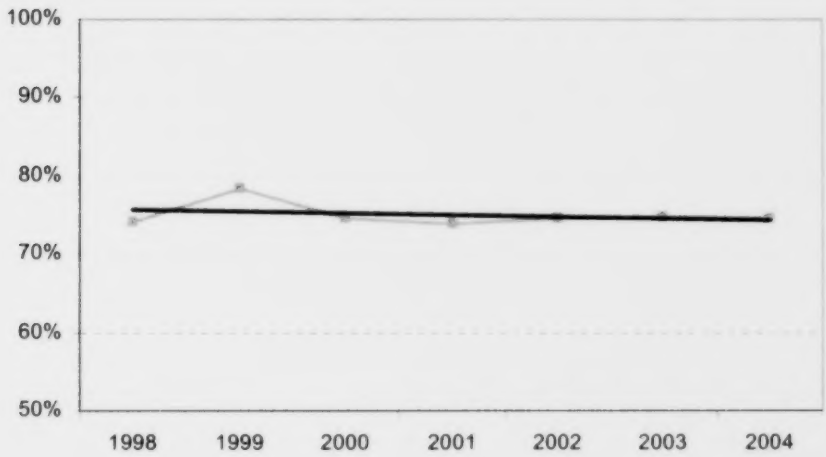
Alberta's beverage container program is effective in the terms of achieving mandated outcomes.

- **Alberta has one of the broadest program scopes** driving significant diversion of beverage containers from the Alberta waste stream. Few other programs include "non traditional" products in their scope that typically have far lower recovery rates—most programs focus on beer and non-beer aluminium, plastic and glass containers.

- **Alberta's recoveries are comparable to all other jurisdictions with similar structures** and are far superior to jurisdictions with non-deposit programs. Alberta's overall recovery is approximately 80%. The mission of Alberta's Beverage Container Management Board is to be a leader in recycling has not been achieved although Alberta is typically marginal points behind the leader of any container category where results can be verified.

- **Alberta's recoveries have plateaued** (Exhibit 3-1). An increase in recovery rates will probably require changes to the program structure, deposit rates (and associated recycling fees) and specific product marketing initiatives.

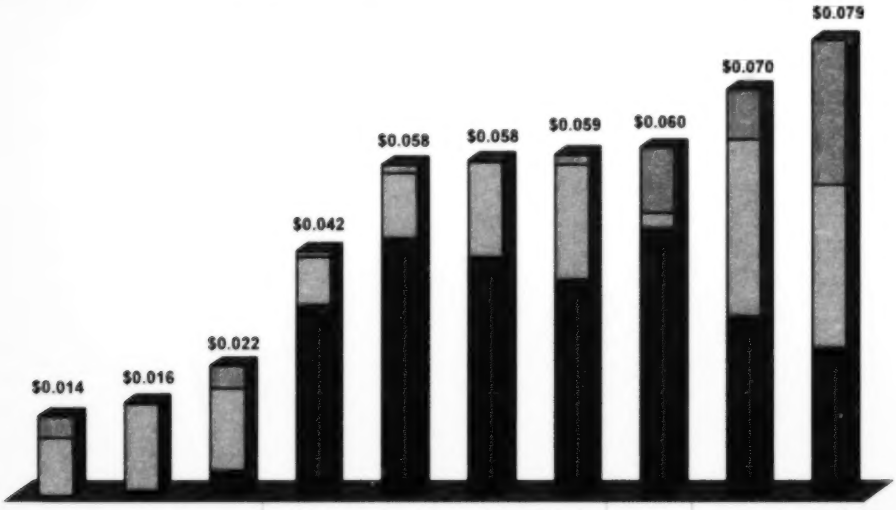
Exhibit 3-1
Alberta Non-beer Program Performance through 2004



Alberta's financial costs achieving the mandated beverage container outcomes are reasonable compared to other jurisdictions.

- **The cost to operate Alberta's beverage container recycling programs is competitive to comparable jurisdictions** with the highest recoveries, and Alberta is a world leader in terms of actual transportation and processing costs. Transportation and processing costs compare favourably to other jurisdictions in spite of the duplication created by two recycling streams—beer and non-beer. Exhibit 3-2 illustrates these costs among benchmarked programs

Exhibit 3-2
Financial Performance of Benchmarked Programs



	Manitoba	Ontario	California	Nova Scotia*	Alberta	Sask.	British Columbia	Sweden	Nfld.	Norway
System Development & Marketing	$0.004	$0.000	$0.004	$0.001	$0.001	$0.000	$0.002	$0.011	$0.009	$0.025
Transportation, Admin., Processing	$0.010	$0.015	$0.014	$0.008	$0.011	$0.016	$0.020	$0.003	$0.031	$0.028
Avg. Handling Commissions	$0.000	$0.001	$0.004	$0.033	$0.044	$0.041	$0.037	$0.046	$0.031	$0.026

**Processing cost unavailable*

- **There is an inherent conflict when funding the beverage container recycling program through unredeemed deposits and recycling fees or levies**. Increasing recoveries will reduce unredeemed deposits, thus recycling fees would rise. Industry has generally resisted recycling fees, and would resist an increase in these fees due to perceived negative impacts on sales—thus there is a financial incentive for industry to not increase recoveries and maintain the current level of unredeemed deposits. Alternative structures mitigating the impact of this conflict should be investigated.

- **Overall program costs are loosely correlated to recovery—typically overall costs rise with recovery rates**, regardless of program structure. For example, Alberta has a 75% recovery rate and $0.058 cost per container recycled whereas Ontario has a 41% recovery rate and $0.016 cost per container recycled (both consider non-beer beverage containers).

- Two Scandinavian programs, Norway and Sweden, have programs with higher recovery rates and even higher costs when normalized for purchase price parity. **Saskatchewan has a higher overall recovery rate with comparable costs and scope**. The major difference between the Alberta and Saskatchewan programs are the higher deposits and return refunds paid consumers. There is also a perception that a portion of out of province containers are redeemed in Saskatchewan taking advantage of these higher redemption rates. Alberta and BC are virtually identical in scope and costs.

- **Alberta's handling commissions are higher than those of comparable jurisdictions, offsetting the efficiencies generated by the transportation and processing infrastructure**. Handling commissions are driven primarily by labour costs and are part of a broader labour issue in Alberta. Europe, California and several other jurisdictions are implementing technology solutions such as reverse vending machines to reduce operating costs over time. Alberta is presently piloting this technology in Calgary.

Alberta's program compares favourably to other jurisdictions in terms of the disposition of collected materials.

- **Virtually all of Alberta's beverage containers are recycled or re-used** in what is essentially a closed loop system. Virtually all other jurisdictions have a closed loop system comparable to Alberta. The waste materials—aluminium, plastic, glass and paper—are marketable commodities with value that are partially subsidized where necessary by program funding. Low-value paper aseptic and gable top packaging are incinerated for energy recovery in some Scandinavian jurisdictions.

Alberta's beverage container recycling program incorporates efficient mechanisms to achieve program objectives. There are other mechanisms to consider.

- **Increasing deposit rates should be considered**. Both Saskatchewan and California experienced increased recoveries when they increased their deposit rates. Deposit rates in Alberta (like most other programs) have stayed virtually constant while beverage prices have increased over the past several years.

- **Consolidating actual deposit rates to a constant rate should also be considered**. Alberta deposit rates range from $0.05 to $0.20 depending upon the type of container thereby creating complexity in the system. There may be merit in consolidating to a constant deposit rate for all eligible containers – potentially resulting in processing efficiencies through reduced sorting and counting requirements.

- **Alberta handling commissions are higher than most jurisdictions**. Average labour rates are moving towards $15 per hour for handling waste beverage containers and generate a significant financial burden on the overall system. Given Alberta's overall labour market issues, alternatives should be investigated. Alternatives include the implementation of reverse vending machines and similar technologies, and process changes that consolidates container sorting at central facilities thereby reducing overall labour costs at depots.

- **Alberta's program scope is already very broad but there is opportunity to further broaden the program scope to including milk containers** with minimum logistical effort—this is question of Alberta policy.

- **Increased marketing regarding low recovery items (gable tops, tetra packs, etc.) should be considered** to increase public awareness of the existence of deposit redemption opportunities. Furthermore, increasing the accessibility of depots by encouraging municipalities to allow relocation of depots to commercial locations from presently largely industrial area locations may also serve to improve redemption opportunities.

- **Ontario and Manitoba have adopted non-deposit programs focused on broader Blue Box programs resulting in lower recovery rates and per unit recycling costs**.

  - The objective in Ontario is to consolidate recycling efforts for a much broader range of products than just beverage containers. This achieves both lower costs through economies of scale and the implementation of extended producer responsibility (EPR) generating long-term stewardship benefits by involving

manufacturers. The result has been approximately half the recovery rate of containers at one-third the cost in Alberta.

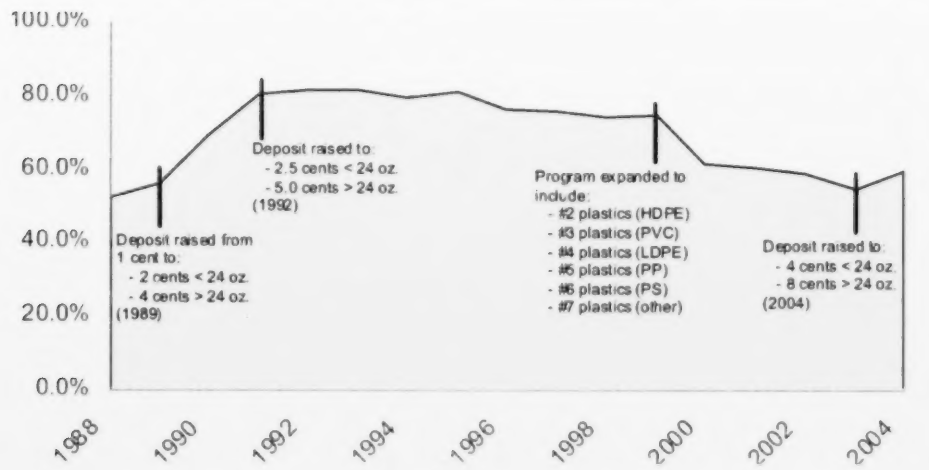
- Manitoba's program is similar, but containers have a recycling levy of $0.02 charged on eligible containers that funds a provincial Blue Box program and subsidizes numerous other materials collected through municipal programs, including newsprint, cardboard, packaging, etc.

The following are specific examples of leading practices for Alberta to consider for further review:

- **Saskatchewan's beverage container recycling program is comparable to Alberta's with higher recovery rates**. The main difference between these programs is that Saskatchewan has higher deposit rates and generates higher recovery rates. Saskatchewan's recovery rate is 89% versus Alberta's 80% while overall costs are comparable – Saskatchewan's per unit cost is $0.058 versus Alberta's cost of $0.058.

- **California and Saskatchewan increased their deposit rates and have since realized increased recovery rates** (Exhibit 3-3). Both experienced a plateaued program (despite the addition of items to the program scope) throughout the 1990s (California even saw recovery rates decline from 80% to less than 60%). Both programs have experienced improved recovery rates since deposit rates were increased.

Exhibit 3-3
California's Overall Recovery Rates Through 2004



- **Finland, Norway and Sweden have comparable programs and demographics (low population density) to Alberta, and face similar collection and transportation challenges**. These countries encourage refillable bottles versus disposable containers, have higher deposit fees (when normalized), employ a sliding scale levy in Norway – rewarding manufacturers for superior recovery, and have widely employed technological solutions (reverse vending machines) to optimize recovery rates and operating costs.

manufacturers. The result has been approximately half the recovery rate of containers at one-third the cost in Alberta.

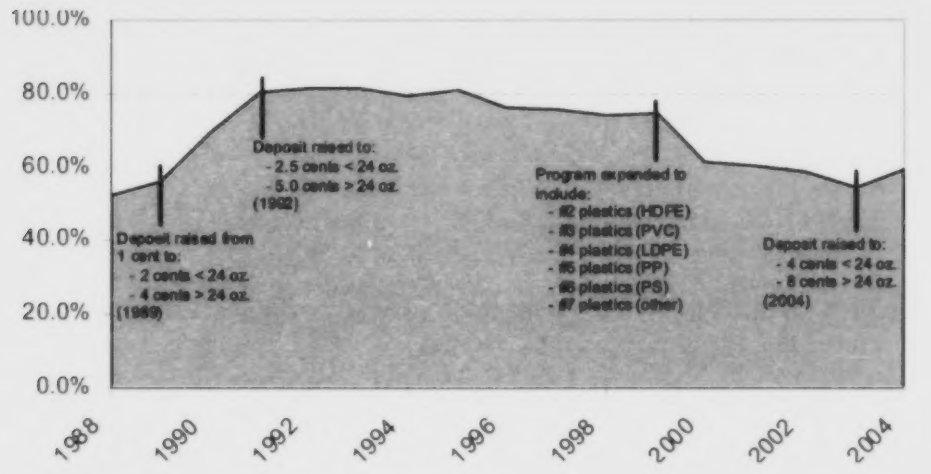
- Manitoba's program is similar, but containers have a recycling levy of $0.02 charged on eligible containers that funds a provincial Blue Box program and subsidizes numerous other materials collected through municipal programs, including newsprint, cardboard, packaging, etc.

The following are specific examples of leading practices for Alberta to consider for further review:

- **Saskatchewan's beverage container recycling program is comparable to Alberta's with higher recovery rates**. The main difference between these programs is that Saskatchewan has higher deposit rates and generates higher recovery rates. Saskatchewan's recovery rate is 89% versus Alberta's 80% while overall costs are comparable—Saskatchewan's per unit cost is $0.058 versus Alberta's cost of $0.058.

- **California and Saskatchewan increased their deposit rates and have since realized increased recovery rates** (Exhibit 3-3). Both experienced a plateaued program (despite the addition of items to the program scope) throughout the 1990s (California even saw recovery rates decline from 80% to less than 60%). Both programs have experienced improved recovery rates since deposit rates were increased.

Exhibit 3-3
California's Overall Recovery Rates Through 2004



- **Finland, Norway and Sweden have comparable programs and demographics (low population density) to Alberta, and face similar collection and transportation challenges**. These countries encourage refillable bottles versus disposable containers, have higher deposit fees (when normalized), employ a sliding scale levy in Norway—rewarding manufacturers for superior recovery, and have widely employed technological solutions (reverse vending machines) to optimize recovery rates and operating costs.

3.2 SCRAP TIRES

Motor vehicles are an integral component of key societal sectors including leisure, industrial, commercial, and residential applications. Rubberized tires are extremely effective given the characteristics required to transfer motor vehicle energy to the road surface and maintaining effective road-contact under various conditions. Because of the widespread use of these tires, the use of rubberized motor vehicle tires on roads and highways expands in direct relation to the increasing number of vehicle kilometres driven in a growing economy. Tire treads are inevitably subject to wear and have predictably limited life spans. Effectively managing scrap tires at the end of their useful lifetime becomes an environmental priority given the potential risk of environmental and health hazards.

Scrap tires as a component of the waste stream are typically benign and individually have little environmental impact other than the space required to manage them and the resources wasted by not recycling the materials. When stored in volume, the potential risk becomes much more significant with tire fires being of primary concern. Given the ability of administrative organizations to regulate the storage and end-use of scrap tires, monitoring scrap tire flow and promoting responsible scrap tire management is the driver of most worldwide programs.

Alberta's scrap tire program is very effective in the terms of achieving mandated outcomes.

- **Virtually all programs have comparable scopes**. The Alberta program scope encompasses passenger, light truck and commercial tires. Off road tires (typically larger construction and mining equipment tires) are presently excluded.

- **Alberta's recoveries are exceptionally high and comparable to leading jurisdictions** with similar program scopes. These tire programs are mature and recycle virtually every tire sold and report recoveries approaching 100%.

- **Some programs report recoveries exceeding 100% as they are still processing large stockpiles**. Many other programs still landfill or export (for land filling or burning) a significant portion of tires collected.

- **Alberta is a leader in research and market development programs funding among the benchmarked programs**—it finances more dollars per PTE recovered than any other program.

Alberta's financial costs achieving the mandated scrap tire outcomes are higher compared to other jurisdictions.

- **Alberta's overall program costs are higher than most comparable programs for two reasons**:

  - Alberta's public policy to not burn tires results in the subsidization of alternative end use products—all more expensive end uses than burning.

  - Alberta has committed to fund research and development into alternative end uses for scrap tires. Over 40% of the Alberta program revenues over the past three years have been expended on research and development for alternative end uses for tires along with program marketing (public education). No other program compares to Alberta's efforts and expenditures in these areas.

Exhibit 3-4 compares program costs among benchmarked programs.

Exhibit 3-4
Scrap Tire Program Costs per PTE by Jurisdiction

	Alberta	New Brunswick	Sask	P.E.I.	Manitoba	British Columbia	Arkansas	Arizona	Newfoundland	Utah	California	Illinois	Florida
Advertising & System Development	$1.63	$0.18	$0.15	$-	$0.05	$-	$-	$-	$0.01	$-	$0.09	$0.02	$-
Processing, Transportation and General Costs	$3.13	$3.46	$2.96	$2.94	$2.19	$2.11	$1.59	$1.56	$1.55	$0.87	$0.76	$0.44	$0.21

- **The actual Alberta collection, transportation and process costs—incentives paid—ranged between $2.62 and $2.92 per tire over the past several years, and are comparable to most other jurisdictions.**

Alberta's scrap tire program disposes of collected materials in a different manner than most jurisdictions. Alberta disposal is partially effective as virtually no scrap tires are landfilled—the issue is that the system is not a closed loop as products manufactured from scrap tires ultimately enter the waste stream.

- **Most jurisdictions burn tires (termed "Tire Derived Fuel" or TDF)**. Alberta's policy is to not burn scrap tires, directing them to other value-added end uses. Table 3-1 illustrates North American scrap tire markets by jurisdiction.

- **Alberta's end uses for tires include civil engineering products (e.g. shred lining for landfills, asphalt, etc) and manufactured products (e.g. mats, bricks flooring, etc)**.

- **Second generation recycling options require consideration**. Manufactured products currently constructed from scrap tires have limited lifecycles and ultimately enter the waste stream. There may be merit in considering adding these products to the program to create a closed loop program rather than what essentially is short-term waste avoidance.

Table 3-1
North American Scrap Tire End Use Markets

Jurisdiction	TDF	Export	Civ. Eng & Shred	Crumb & Products	Landfill	Other	Jurisdiction	TDF	Export	Civ. Eng & Shred	Crumb & Products	Landfill	Other
Alberta			**60%**	**40%**			Massachusetts						100.0%
B.C.	27%			73%			Michigan	90.3%		9.7%			
Manitoba		40%*	41%	19%			Minnesota			100.0%			
N.B.				100%			Mississippi	66.7%			33.3%		
Newfoundland						100%	Missouri	80.0%		10.0%	10.0%		
Nova Scotia				70%		30%	Montana			5.4%		94.6%	
Ontario		30%*	6%	49%	8%	6%	Nebraska			84.0%			16.0%
P.E.I.		88%	12%				Nevada					100.0%	
Quebec	24%			76%			New Hampshr						100.0%
Saskatchewan		1%	1%	63%	32%	4%	New Jersey				100.0%		
Yukon		100%					New Mexico						100.0%
Alabama	38.5%				57.7%	3.8%	New York			82.2%	13.7%		4.1%
Alaska						100.0%	North Carolina	31.6%		31.6%	36.8%		
Arizona				100.0%			North Dakota						100.0%
Arkansas	32.3%		43.0%			24.7%	Ohio			94.1%			5.9%
California	21.1%	14.0%	14.0%	21.1%	29.8%		Oklahoma	72.2%		26.9%	0.9%		
Colorado			35.3%	58.8%		5.9%	Oregon	8.3%		9.6%	30.4%	48.3%	3.4%
Connecticut	83.3%	16.7%					Pennsylvania	92.5%		3.9%	2.0%	1.7%	
Delaware						100.0%	Rhode Island				100.0%		
Florida	33.1%	6.4%	19.1%	31.8%	9.6%		South Carolina	75.9%		23.4%	0.6%		
Georgia	87.0%		12.4%	0.6%			South Dakota	100.0%					
Hawaii	80.0%		20.0%				Tennessee	54.2%		25.0%		20.8%	
Idaho	100.0%						Texas	79.8%		14.6%			5.5%
Illinois	81.8%		10.1%	8.1%			Utah	47.4%		52.6%			
Indiana			100.0%				Vermont						100.0%
Iowa	53.2%		43.7%	3.2%			Virginia	19.6%		77.8%	2.6%		
Kansas	21.7%				60.9%	17.4%	Washington	5.2%		9.3%	1.9%	74.3%	9.3%
Kentucky	40.0%		40.0%			20.0%	West Virginia					100.0%	
Louisiana	70.0%		30.0%				Wisconsin	100.0%					
Maine	77.8%		22.2%				Wyoming					100.0%	
Maryland	63.7%	21.2%	4.5%	10.6%			**U.S. Overall**	49.8%	**3.5%**	**21.7%**	**10.8%**	**10.3%**	**3.9%**

* Exported tires are mostly sent abroad to be consumed as TDF.

Alberta's scrap tire recycling program incorporates efficient mechanisms to achieve program objectives. There are other mechanisms to consider.

- **Alberta's recoveries are maximized within the current scope**—improvement opportunities involve broadening the program scope to include off road tires, reducing program costs, and developing new end uses for scrap tires.

- **The policy regarding not burning tires should be reviewed**. Leading environmental stewardship countries in Europe such as Norway and Sweden burn tires—Alberta should revisit this policy.

- **Crumb rubber is a commodity that is influenced by the price of oil and gas**. The rising price of oil and gas should increase the value of scrap tires as a fuel source. This will reflect an increased demand of scrap tires both as an alternative low cost fuel in Alberta or as an export commodity.

- **Adding off road tires is the obvious potential program enhancement**. The barrier is that the infrastructure required to handle them is extremely costly and presently not in place. The other barrier is that markets for

Table 3-1
North American Scrap Tire End Use Markets

Jurisdiction	TDF	Export	Civ. Eng & Shred	Crumb & Products	Landfill	Other
Alberta			**60%**	**40%**		
B.C.	27%			73%		
Manitoba		40% *	41%	19%		
N.B.				100%		
Newfoundland						100%
Nova Scotia				70%		30%
Ontario		30% *	6%	49%	8%	6%
P.E.I.		88%	12%			
Quebec	24%			76%		
Saskatchewan		1%	1%	63%	32%	4%
Yukon		100%				
Alabama	38.5%				57.7%	3.8%
Alaska						100.0%
Arizona				100.0%		
Arkansas	32.3%		43.0%			24.7%
California	21.1%	14.0%	14.0%	21.1%	29.8%	
Colorado			35.3%	58.8%		5.9%
Connecticut	83.3%	16.7%				
Delaware						100.0%
Florida	33.1%	6.4%	19.1%	31.8%	9.6%	
Georgia	87.0%		12.4%	0.6%		
Hawaii	80.0%		20.0%			
Idaho	100.0%					
Illinois	81.8%		10.1%	8.1%		
Indiana			100.0%			
Iowa	53.2%		43.7%	3.2%		
Kansas	21.7%				60.9%	17.4%
Kentucky	40.0%		40.0%			20.0%
Louisiana	70.0%		30.0%			
Maine	77.8%		22.2%			
Maryland	63.7%	21.2%	4.5%	10.6%		
Massachusetts						100.0%
Michigan	90.3%		9.7%			
Minnesota			100.0%			
Mississippi	66.7%			33.3%		
Missouri	80.0%		10.0%	10.0%		
Montana			5.4%		94.6%	
Nebraska			84.0%			16.0%
Nevada					100.0%	
New Hampshire						100.0%
New Jersey				100.0%		
New Mexico						100.0%
New York			82.2%	13.7%		4.1%
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North Dakota						100.0%
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Pennsylvania	92.5%		3.9%	2.0%	1.7%	
Rhode Island				100.0%		
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South Dakota	100.0%					
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Texas	79.8%		14.6%			5.5%
Utah	47.4%		52.6%			
Vermont						100.0%
Virginia	19.6%		77.8%	2.6%		
Washington	5.2%		9.3%	1.9%	74.3%	9.3%
West Virginia					100.0%	
Wisconsin	100.0%					
Wyoming					100.0%	
U.S. Overall	**49.8%**	**3.5%**	**21.7%**	**10.8%**	**10.3%**	**3.9%**

* Exported tires are mostly sent abroad to be consumed as TDF

Alberta's scrap tire recycling program incorporates efficient mechanisms to achieve program objectives. There are other mechanisms to consider.

- **Alberta's recoveries are maximized within the current scope**. Improvement opportunities involve broadening the program scope to include off road tires, reducing program costs, and developing new end uses for scrap tires.

- **The policy regarding not burning tires should be reviewed**. Leading environmental stewardship countries in Europe such as Norway and Sweden burn tires. Alberta should revisit this policy.

- **Crumb rubber is a commodity that is influenced by the price of oil and gas**. The rising price of oil and gas should increase the value of scrap tires as a fuel source. This will reflect an increased demand of scrap tires both as an alternative low cost fuel in Alberta or as an export commodity.

- **Adding off road tires is the obvious potential program enhancement**. The barrier is that the infrastructure required to handle them is extremely costly and presently not in place. The other barrier is that markets for

shred and crumb rubber commodities are unstable, and the addition of more volume may overwhelm the current market. A policy move towards burning, even if restricted to off road tires, would substantially mitigate these barriers.

- **The impact of moving to burning as an end use and augmenting the program scope with off road tires will impact the ADS and incentive rates**—rates need to be reviewed concurrently with these driving factors.

- **Retreading scrap tires typically falls outside the scope of most programs**. Several European programs along with Quebec have brought retreading into their programs and offer incentives encouraging the re-use of scrap tires.

- **Technologies such as pyrolysis** (heating tires and other waste products in a vacuum to produce fuels and materials that can be collected and used later) **have been existence for almost twenty years but have yet to be proven commercially viable**. Several other technologies have also been proposed but none have proven viable. These alternative technologies need to be monitored to identify potentially viable end use processes for scrap tires.

- **Alberta sponsored and funded research and development (R&D) initiatives into alternative end uses for scrap tires are problematic**. The essence of R&D is the risk of tangible results, and to date minimal results has been achieved despite significant expenditures. R&D regarding alternative end uses for scrap tires, much like R&D for a cure for cancer or any other societal issue, is by default a positive initiative. The question is who should conduct R&D and how R&D should be funded. Alternative models for R&D should be revisited involving both industry and stakeholders in other jurisdictions.

There are specific examples of leading practices for Alberta to review. They are:

- **Scandinavian countries are viewed as innovators and leaders in environmental stewardship, yet these nations are not averse to consuming scrap tires in TDF applications**. Approximately 48% of Sweden's tires are used in TDF, Finland uses TDF as a secondary alternative with preference given to value-added materials, and Norway burns 34% of its scrap tires for energy recovery.

- **Off-the-road tires (OTRs) are difficult and costly to recycle**. Some European programs and Saskatchewan charge higher levies to offset the additional transportation and processing costs incurred while managing OTRs.

3.3 WASTE ELECTRONICS

Rapid technological advancement combined with reduced product life cycles is creating a global proliferation of electronic products. Despite the drive towards miniaturization, the overall tonnage of electronics manufactured and sold throughout the world is ever increasing.

The resulting waste streams are creating issues both locally in Alberta and across the world. Waste electronics consist primarily of metal and plastic; with much smaller amounts of glass, rubber, and a host of other materials including many toxins such as lead, mercury and freon. Overall metals and plastics comprise approximately 12% of the current total waste stream in Alberta—waste electronics contribute a portion of this tonnage, and the associated toxins create a significant environmental stewardship concern.

The vast majority of scrap products in the electronics waste stream can be recycled and have value as a recycled commodity. The barrier to recycling such products is the cost and logistics of collection, transportation and processing of the materials. This is a particularly salient issue in places such as Alberta with such a large area and low population density. Recycling scrap electronics, with some exceptions in urban areas, is largely economically unfeasible without the support of a formal recycling program.

There are few regulated electronics recycling programs currently operating. There are only two other provincial programs besides Alberta's in North America; the remainder being Europe and Asia. Most other North American jurisdictions deal with electronics on a project basis (e.g. annual round-ups, etc) with larger metal-centric goods (e.g. appliances) being recycled haphazardly based on geography and current commodity prices.

Europe has established the Waste Electrical and Electronic Equipment (WEEE) directive, mandating all EU members to implement an electrical product recycling program by August 2005. It appears that only six of the 25 EU members have actually implemented an electronic recycling program before the WEEE Directive was passed, with the balance of the programs still under development or in the implementation stage.

Alberta's waste electronics program appears to be structured effectively in the terms of achieving mandated outcomes—the program is in its infancy thus effectiveness is unproven.

- **Alberta has much narrower program scope than the European programs driving less diversion of waste electronics from the Alberta waste stream**. The European programs include white goods (washers, dryers, etc), brown goods (smaller household appliances such as blenders, toasters, etc), power tools, gardening tools, toys, medical equipment and lighting (tubes and fixtures). Medical equipment and lighting are of particular interest given their propensity to contain toxins. Program scopes are summarized in Table 3-2.

Table 3-2
Waste Electronics Program Scope Summary

Program	IT Products and TV's	White Goods	Brown Goods	Electric Tools	Gardening Equipment	Toys or Leisure	Medical Equipment	Lighting Equipment
ERA	√							
Recupel	√	√	√	√	√			√
Denmark Tax	√	√	√	√	√	√	√	
NVMP	√*	√	√	√	√		√	
ICT Milieu	√							
El Retur	√	√	√	√	√	√	√	
El Kretsen	√	√	√	√	√	√	√	√
SWICO	√		√				√	
S.EN.S.		√		√	√	√		√
Delaware	√		√			√		
California	√*							

*includes TV's or audio/visual equipment only

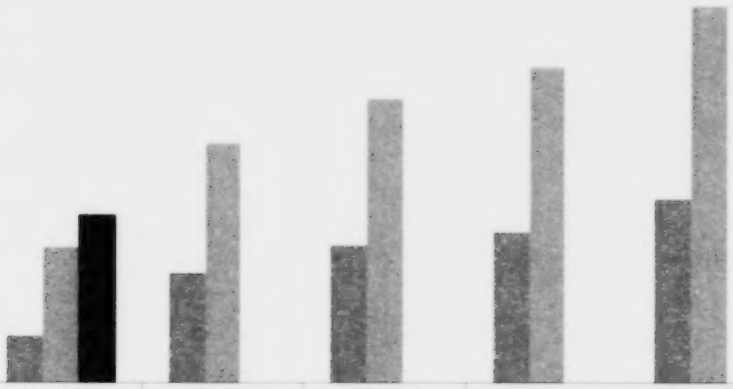
- **Alberta's eWaste program's scope is comparable to Delaware's and greater than California's**. There are no other North American programs presently operating.

- **Recovery is measured on a tonnes recovered per capita in Europe** and this method is recommended for benchmarking purposes until better sales data is captured worldwide. Recovery is difficult to measure for

electronic recycling due to the seeming infinite range of products, sizes, weights, etc; whereas beverage containers and tires have common units making sales and recovery logistically possible to calculate.

- **Alberta's recoveries are higher in the program's first year of operation** compared to the recovery results in the first year of operation for programs in the Netherlands and Switzerland—Alberta recovered .66 kg/capita versus Netherlands at .18 kg/capita and Switzerland at .53 kg/capita (Exhibit 3-5). This is especially impressive given Alberta's geographic challenges (large area with low population density). Another factor is that Alberta has yet to recycle any material collected in Edmonton, representing approximately a third of Alberta's population.

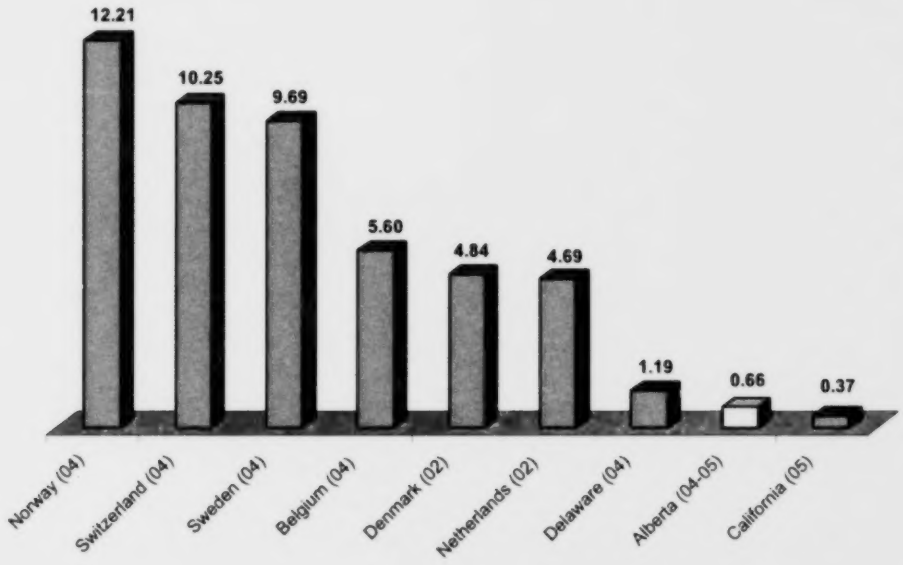
Exhibit 3-5
Quantity Collected per capita (kg) in the First 5 years of Program Implementation



	1st Year	2nd Year	3rd Year	4th Year	5th Year
ICT Milieu	0.18	0.43	0.54	0.59	0.72
SWICO	0.53	0.94	1.12	1.24	1.48
Alberta	0.66				

- **Mature European programs have recoveries upwards of 12 kg/capita—significantly higher than Alberta's .66 kg/capita.** This is largely driven by the broader program scopes that include white and brown goods exponentially driving tonnage. In addition, while haphazard and inconsistently conducted across Alberta, white and brown goods are independently recycled by municipalities thus this comparison is at best directional. Findings capturing electronics recovery rates throughout benchmarked programs are illustrated in Exhibit 3-6.

Exhibit 3-6
Total Tonnes Collected per Capita

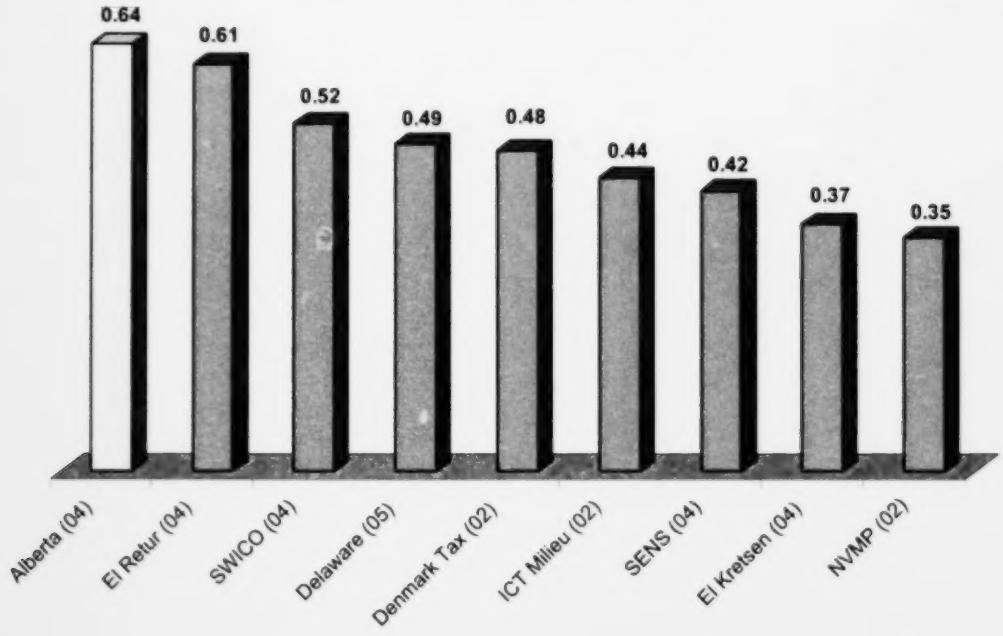


Alberta's waste electronics program's financial costs appear to be reasonable when compared to other jurisdictions—again, the program is in its infancy thus cost effectiveness is unproven.

- **Geography and economies of scale do impact the costs of comparison programs**.
- **There appears to be a relationship between a jurisdiction's area (sq. kms) and the direct costs per kg**—this relationship will invariably negatively impact Alberta given Alberta's large and sparsely populated area..

- **Alberta's costs are difficult to measure given that the program is in its infancy and has incurred significant start-up costs**. A better comparison is of direct transportation and processing costs. Alberta's costs during its first five months of operation were $0.64 per kg whereas Delaware and the European program costs ranged from $0.35 to $0.61 per kg. (Exhibit 3-7)

Exhibit 3-7
Direct Processing and Transportation Costs ($ per kg)



- **Economies of scale (e.g. broader program scope dramatically increasing tonnage) also impact costs**. There is also a direct relationship between increasing tonnage and lower unit costs, although this relationship is not as dramatic as could be expected.

The disposition of collected materials in Alberta's program appears effective.

- **European programs report recycling of 70% to 90% of waste electronic component tonnage collected**—each program defines 'recycling' differently, but the general definition is that these are materials not incinerated or landfilled.

- **Alberta's program recycles virtually all material other than consoles, thus recoveries are comparable to the European programs**.

Alberta's waste electronics recycling program incorporates efficient mechanisms to achieve program objectives. There are other mechanisms to consider.

- **Most European programs structure their programs around the Extended Producer Responsibility (EPR) philosophy**. The actual operations of each of these programs appear extremely comparable to Alberta's delegated arrangement structure other than the reporting relationships of the organization's directors.

- **Alberta should revisit its program scope and consider including other items and categories**. White and brown goods, tools, and toys would exponentially increase tonnage driving economies of scale and partially addressing the geographic barriers. Incorporating medical equipment and lighting potentially addresses landfill toxin issues. Infrastructure is a significant barrier but investigating opportunities to increase program scopes appears to have merit.

- **All European programs, with the exception of Denmark, structure their programs with a recycling fee collected at purchase to fund the collection, transportation and processing of the waste electronics**. Denmark funds their program through a municipal tax levy, comparable to municipal Blue Box programs in municipalities in Alberta. Recycling fees appear to be the most accepted method of structuring and financing this type of program.

- **Municipal collection sites, like those employed in Alberta, are the primary collection points for successful European programs**. Return-to-retail collection tends to be a lower volume collection method and appears focused on large delivery oriented items (e.g. white goods).

- **The number of collection sites is an important element in European programs. Programs in larger countries have over 1000 collection sites versus Alberta's 120**. Smaller jurisdictions such as the Netherlands and even Delaware (they are comparable in size to Alberta's Capital Region) have many more collection sites than Alberta. Even when municipal sites are isolated from return to retail facilities, European programs have exponentially greater number of municipal collection site than Alberta.

- **Several European programs provide retailers with an administrative fee for collecting and remitting the recycling fees**. Alberta may want to review the feasibility of such an arrangement to compensate retailers for the additional administration created by the waste electronics program.

- **European programs tend to be dominated by several small processors in each country rather than evolving to a few large processors**. It would appear that the broad program scopes and resulting higher tonnages create an environment where several processors can compete in specialized markets. Several of these processors also tend to be "sheltered workshops", thus other factors drive the market beside economics. The impact of programs beginning in B.C. and Saskatchewan during the next year may redefine the economics for transporting and processing waste electronics in Alberta.

There are specific examples of leading practices for Alberta to review. They are:

- **Each of the identified European programs has been operating for years and is worthy a further study**.

3.4 OVERALL FINDINGS AND CONCLUSIONS

Several overall themes became apparent when benchmarking Alberta's programs against those in North America and Europe:

- **There may be opportunities to better align the programs along with other independent programs such as municipal Blue Box programs, etc. into a broader environment stewardship strategic plan**. The three focus recycling programs—beverage containers, scrap tires and waste electronics—are managed within Alberta Environment regulations, but otherwise operate independently. Most European programs are industry driven within government regulation, but operate independently of each other as well given their extended producer responsibility approach to environmental stewardship. There may be opportunities to better align and potentially integrate these programs along with other independent stewardship programs such as municipal Blue Box programs, etc. into a broader environment stewardship strategic plan and governance structure driving greater overall waste diversion while achieving better overall efficiencies.

- **Extended Producer Responsibility (EPR) philosophies driving legislative structures need to be revisited**. North American and European jurisdictions legislating broader EPR actions than Alberta tend to structure programs comparable to Alberta's program to comply with local legislation at the lowest possible cost rather than fundamentally changing design, packaging, etc. to drive greater waste avoidance or diversion. The significant difference between industry and government driven programs tends to be the governance model (who appoints the directors), while operational structures appear to be comparable.

  EPR models in Canada such as the Provincial Blue Box program in Ontario are designed to ensure producers (manufacturers and the supply chain) have financial incentives to ultimately divert material from the waste stream and increase the re-use and recycling of materials. The flaw to date appears that the financial incentives tend to be tremendously offset by sales and profitability drivers, thus mitigating their effect.

  A significant negative attribute of industry driven programs is that program information tends to become proprietary thus limiting the transparency of programs—this is an issue specifically with beer container recycling across Canada and with most European recycling programs in general. A lack of information potentially mitigates overall regulatory control, the ability to develop good government environment stewardship policy, and continuous improvement initiatives.

- **Innovation appears best driven through the private sector**. Innovative processing and alternative end uses generating tremendous efficiencies have generally been driven to date by the private sector through economic incentives built into the program structures created in each jurisdiction. For example, EPR oriented programs have generated significant financial efficiencies for beverage container recycling in Alberta (potentially the lower cost per unit program in the world for transportation and processing) despite dual beer and non-beer systems and an inefficient depot structure. Future program structures need to be designed to create optimal financial incentives for private sector innovation in avoiding and/or diverting waste in addition to driving cost efficiencies throughout the system.

- **Alberta public policies need to be revisited around these three programs**. These policies include:
  - **Consolidation of beer and non-beer beverage container recovery streams**--Potential exists to gain efficiencies throughout the program by aligning the system's common collection agents.
  - **Increasing and/or harmonizing beverage container deposit rates**—Deposit rates are a significant driver in generating increased recovery rates.
  - **Burning scrap tires**—Technology is the enabler to burn tires in an environmentally friendly manner.
  - **Out-of-province processing of waste materials**—Potential exists to create more efficient processes leveraging economies of scale and capital investment with neighbouring jurisdictions.
  - **Use of "sheltered workshops"**—Numerous jurisdictions, including Saskatchewan, create employment opportunities for challenged citizens through recycling programs. Further study is required to understand the overall social and cost impacts of such a policy in Alberta.
  - **Investments in research and development for scrap tire end uses**—Alternative end uses for scrap tires, particularly the re-vulcanization of rubber, are a global issue. This type of research may be beyond the capability of Alberta's program to effectively manage and fund. Alternative research and development strategies involving other provincial and state jurisdictions, federal governments, and multi-national rubber product manufacturers and retailers may be a more successful approach.
- **Opportunities to broaden program scopes should be investigated**—there appear to be viable opportunities worthy of further study to add products to the scopes of existing programs:
  - **Beverage Containers—Milk containers should be considered for inclusion into the deposit program**. There is an alternative program yielding lower recoveries, and this class of container could easily be added to the program.
  - **Scrap Tires—Including off road tires into the program would solve a significant issue in Alberta**. Off road tires are a significant issue in Alberta given the growth of the construction industry.
  - **Waste Electronics—Adding additional products such as white goods, brown goods, tools, toys, medical equipment, lighting, etc**. to the program would exponentially increase tonnage and potentially create significant program efficiencies.

4 BEVERAGE CONTAINERS

4 BEVERAGE CONTAINERS

The sale of ready-to-serve beverages in single serving containers has become an increasingly popular means for brandowners to meet the needs of targeted consumers. In the majority of markets, there has been a clear trend moving away from refillable, reusable glass containers towards more economical packaging materials such as aluminium cans and plastic bottles. Furthermore, products are increasingly available in other non-traditional materials, including gable top containers and aseptic packaging. The increasing popularity of the beverages, and the relative freedom of places where they may be consumed, make single serving beverage containers a highly visible component of the litter/waste stream. The result is that the management of post-consumer beverage containers becomes a priority in protecting Alberta's environmental landscape.

As the materials used in container packaging are generally recyclable, waste diversion is an objective central in programs in many jurisdictions, with a strong emphasis on the *recovery* and *recycling* of single-serve containers, and the *reuse* of refillable containers – these "3Rs" are common across many environmental platforms globally.

4.1 ALBERTA BEVERAGE CONTAINER STEWARDSHIP PROGRAM

4.1.1 OVERVIEW

The Province of Alberta has a mature program, with a province-wide initiative being initially launched in 1972. The program was originally designed to manage traditional beverage containers, principally soft drink and liquor containers and eventually included bottled water and juice containers. An expansion of the program occurred in 1997 when gable top and aseptic (tetra brick) containers where included, and again in 2001 when domestic beer containers were brought into the depot collection program.

Alberta has established a Delegated Administrative Organization (DAO) to oversee the management of consumed beverage containers at an arm's length from the government. Working closely with a range of relevant stakeholders, the Beverage Container Management Board (BCMB) is the administrative body that directs industry, and is ultimately responsible to ensure appropriate measures and mechanisms are in place to promote beverage container recycling. Mandated in 1997, pursuant the Beverage Container Recycling Regulation – Alberta Regulation 101/97, the mission of the BCMB is that:

> *"The Beverage Container Management Board will work in partnership with Albertans to oversee a leading, innovative, accessible and cost-effective beverage container management system throughout Alberta."*

A 'Beverage Container', as defined under the legislation, is a container containing: *any liquid that is ready-to-serve and is not exempt from this regulation.* Beverages exempt from the program are limited to the following:

- Milk and milk containers (including new-age flavoured milk)
- Plastic and paper cups that are not sealed by a manufacturer

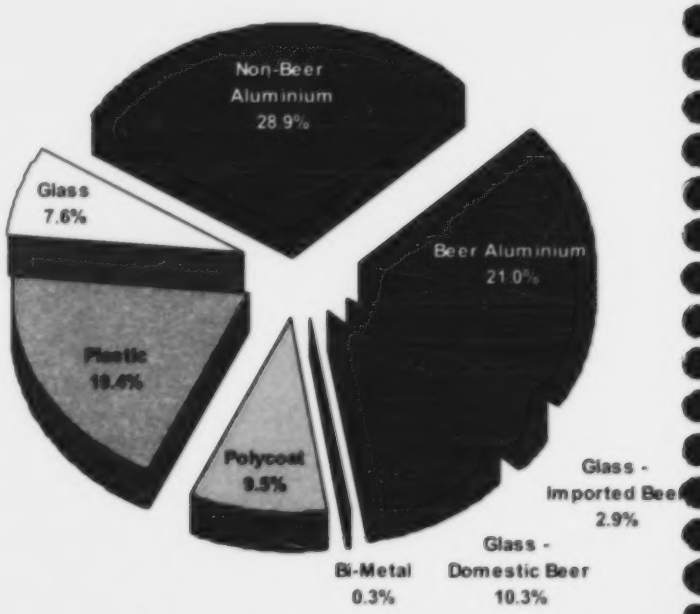
The basis for these exemptions in the first instance is considered as being socially beneficial for the welfare of fixed-income Albertans, and in the second case, the exemption maintains a manageable program scope, as it does not encroach on the fast food or restaurant industries.

4.1.2 MARKET CONDITIONS

Approximately 50,000 registered containers, categorized within eight broad categories are included within the scope of the BCMB-administered program. In 2004, roughly 1.65 billion beverage containers were sold in Alberta. Exhibit 4-1 depicts the current distribution of sales by container type. Aluminium and plastic packaging account for 69.2% of all beverage container sales in Alberta, and over 77.3% of the non-refillable market.

The foundation of the beverage container recovery mechanism is predicated on the consumer-incentive model, where purchasers of beverage containers are motivated to return empty containers to collection points by the promise of compensation upon return. In Alberta, as in many other jurisdictions worldwide, this compensation is found in the form of a deposit paid at the point of sale for the container. In the amount of 5 cents for all containers up to and including 1 litre (10 cents is the standard deposit on beer containers up to 1 litre), and 20 cents for those greater than 1 litre, the deposit can be considered insignificant in terms of the overall container resale value, yet when returned in quantity, can yield significant value to the consumer. The deposit also provides a funding source for collection agents in the form of unredeemed deposits. Funding and program expenses are described later in this section.

Exhibit 4-1
Alberta Beverage Container Market Distribution - 2004



Supporting the deposit incentive on applicable beverage containers is a system of bottle depots that are authorized to collect empty containers, and reimburse consumers. Normally, a depot is setup so that consumers may easily transfer empty containers in bulk (often in garbage bags, plastic bins, or boxes/flats) to a sorter/counter who tallies return figures and separates common containers. Once the final count is complete, he presents the consumer with a chit that is normally given to a cashier for a full refund of the deposit value. Province-wide, 216 privately owned bottle universal depots, and 78 Class 'D' depots (beer only) are operated under regulation from the BCMB. The BCMB is given the authority to set minimum operating hours and defining applicable handling fees. Handling fees are expected to cover the operator's cost of operation, plus a fair return, and are periodically reviewed. At present, a study of bottle depot operations in the province is being conducted, the outcome of which is expected to impact handling fees paid to bottle depots. Appendix A includes a table of current handling fees paid to depots. Depots are also impacted by municipal zoning regulations, which typically translate into depots engaging in business largely within industrial zones. Councils have justified this rationale as being in the best interest of the community, citing noise, traffic, aesthetic, and pollution concerns.

The consumer may also return empty refillable beverage containers to a retailer in Alberta, given that the container;

- is the same size and type as containers sold in the store;
- is not exempt under the legislation, and;
- is reasonably identifiable as being of the same brand sold in the store.

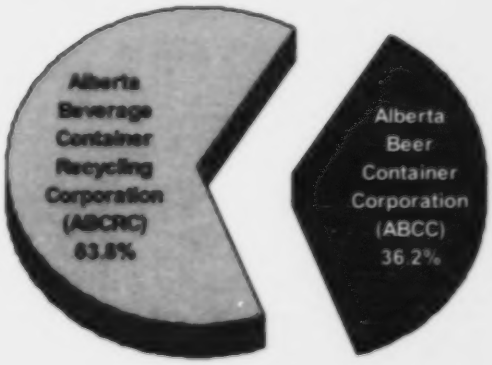
This return-to-retail system only characterises domestic beer returns at licensed liquor retailers and comprises a minute portion of the entire beverage container collection system. It is not a dissimilar component to the collection scheme for refillable industry standard bottles (ISB) across the Canada.

4.1.3 ALBERTA'S COLLECTION SYSTEM AGENTS

Beverage containers, having been collected at central depot points, are picked up by one of two collection system agents in the province. The agents represent the brandowners who sell beverage containers, and they satisfy the brandowners' obligation to collect and recycle empty beverage containers in the province. The distribution of beverage containers collected by collection agent is illustrated in Exhibit 4-2. The collection agents are:

Alberta Beverage Container Recycling Corporation (ABCRC) – The ABCRC represents all bottlers and distributors of non-beer beverage containers in Alberta. Owned in part by Coca-Cola, Pepsi, and Cott Beverages, the company is incorporated as a not-for-profit product stewardship corporation under provincial law and is governed by multi-stakeholder Board of Directors that is named by a Governance Committee. The mission of the ABCRC is *"To provide innovative and economically sustainable recycling of selected beverage containers in Alberta."* In short, the primary functions of corporation include 1) the collection of applicable empty containers from bottle depots, 2) the processing and resale of collected materials, 3) the disbursement of handling fees to bottle depots, and 4) improvement of public awareness through pertinent avenues.

Exhibit 4-2
Beverage Container Distribution by Collection Agent - 2004



Alberta Beer Container Corporation (ABCC) – The ABCC represents brandowners of beer sold in Alberta. It subcontracts the collection and processing of beer cans and bottles to Brewers' Distributor Ltd. (BDL), a joint-venture company owned by Labatt Breweries of Canada, Molson Breweries, and Sleeman Breweries Ltd. It not only collects empty beer containers for recycling, but also acts as the distribution agent for the companies. BDL's mission statement is to *"Provide a quality, cost-effective distribution and container return service for our customers."* It must act as an intermediary agent who collects, processes, and sells recyclable materials, but also must manage the flow of refillable industry standard bottles back to brandowners (each bottle may be reused 18-20 times during its lifetime). The final integral component of ABCC's obligation is to collect applicable deposits and fees, and disperse handling fees to the appropriate stakeholder.

The two collection system agents each should operate within a self-sustaining system. Although unredeemed deposits

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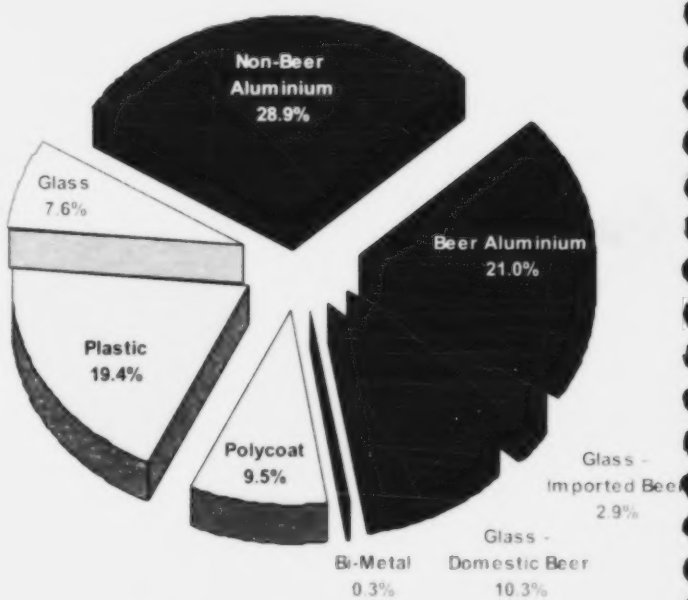

Supporting the deposit incentive on applicable beverage containers is a system of bottle depots that are authorized to collect empty containers, and reimburse consumers. Normally, a depot is setup so that consumers may easily transfer empty containers in bulk (often in garbage bags, plastic bins, or boxes/flats) to a sorter counter who tallies return figures and separates common containers. Once the final count is complete, he presents the consumer with a chit that is normally given to a cashier for a full refund of the deposit value. Province-wide, 216 privately owned bottle universal depots, and 78 Class 'D' depots (beer only) are operated under regulation from the BCMB. The BCMB is given the authority to set minimum operating hours and defining applicable handling fees. Handling fees are expected to cover the operator's cost of operation, plus a fair return, and are periodically reviewed. At present, a study of bottle depot operations in the province is being conducted, the outcome of which is expected to impact handling fees paid to bottle depots. Appendix A includes a table of current handling fees paid to depots. Depots are also impacted by municipal zoning regulations, which typically translate into depots engaging in business largely within industrial zones. Councils have justified this rationale as being in the best interest of the community, citing noise, traffic, aesthetic, and pollution concerns.

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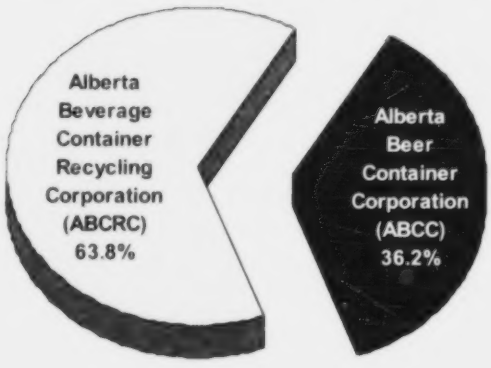

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The two collection system agents each should operate within a self-sustaining system. Although unredeemed deposits

accounted for roughly $18.9 million in 2004, and the sale of recycled materials led to a further income of $22.0 million, the collection system agents are still required to levy a container recycling fee to meet their funding requirements and ensure that recycling remains economically viable. The fee itself is in the order of 0-10 cents, and allows for the ABCRC and the ABCC to maintain a policy of no cross-subsidization for container recycling (each container stream funds its respective recycling). This is necessitated by the reality that materials besides aluminium lack adequate resale value. Appendix B provides further information when it comes to the fees imposed within the regime in 2004.

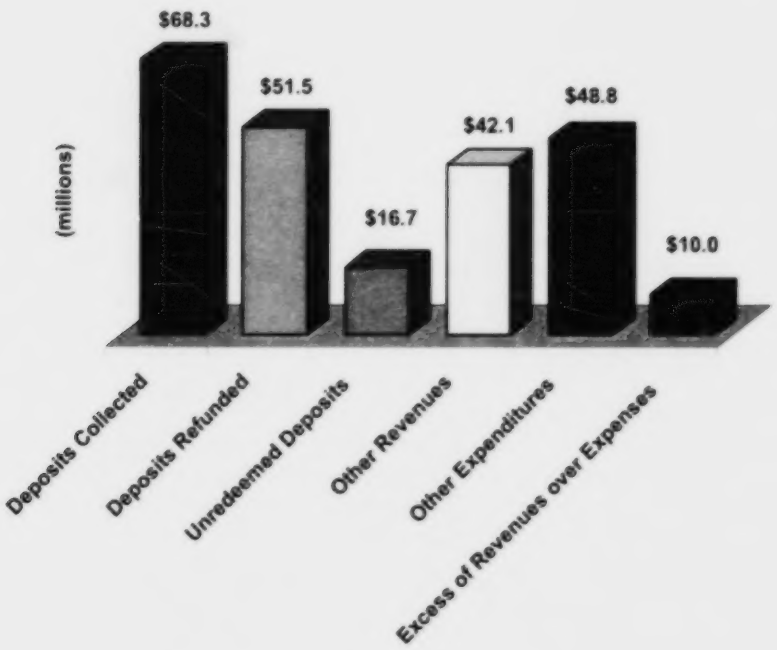
4.1.4 NON-BEER FINANCIAL PERFORMANCE

The following sections highlight the non-beer program's financial performance, as reported by the ABCRC.

ABCRC - $10 million in Net Revenue over Expenses

During the 2004 calendar year the ABCRC collected, processed, and managed the funds for 840 million containers. They also reported total gross operating costs in the order of $48.8 million, or about ¢5.8 per container recovered. As gross revenues incurred totalled $58.8 million, the resulting excess of revenues over expenses surpassed $10.0 million during the year for a net gain per container of ¢1.2 per container. Exhibit 4-3 depicts the ABCRC's revenues and expenses for 2004.

Exhibit 4-3
Magnitudes of Financial Performance for Key Areas - 2004



Revenues and expenses are broken down by container stream in the following chapters, detailing the specific idiosyncrasies that exist when recycling different packaging materials.

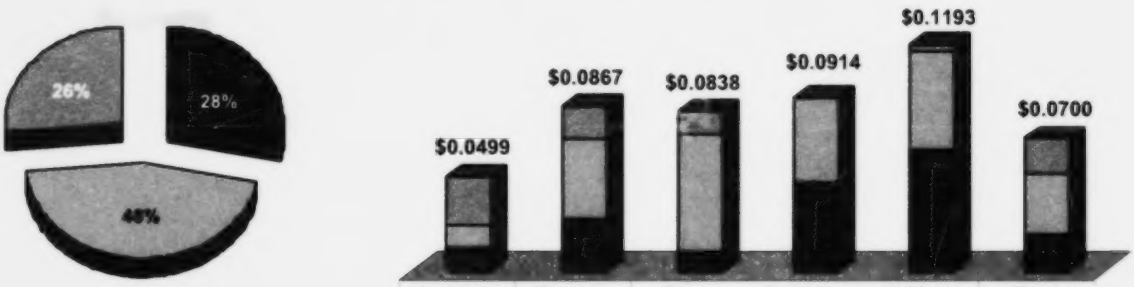
Value of Recycled Materials Insufficient to Fund Operations

Revenues are generated from a combination of container recycling fees (45.3%), unredeemed deposits (28.4%), and the sale of recycled materials (26.3%). Both the value of the deposit and the container recycling fee are paid by consumers at the point-of-sale, and are usually transparent charges, often visible on consumers' receipts.

Deposits paid by Albertans in 2004 totalled $68.3 million; however only unredeemed deposits should be considered general revenue as over $51.5 million was dispersed as refunds paid to bottle depots over the same period. Otherwise, the revenue and expenditure profiles would be overwhelmed by the flow of deposits and would not reflect true operating performance. Unredeemed deposits accounted for $16.7 million in program.

Exhibit 4-4 illustrates the revenues generated by container stream for non-beer beverage containers in 2004.

Exhibit 4-4
Revenues Generated by Non-beer Container Material - 2004



	Aluminium	Plastics	Glass	Polycoat	Bi-Metal	Total
Operating Income	$0.0261	$0.0170	$0.0112	$0.0004	$0.0040	$0.0184
Container Recovery Fees	$0.0117	$0.0421	$0.0623	$0.0437	$0.0510	$0.0317
Unredeemed Deposits	$0.0122	$0.0276	$0.0103	$0.0473	$0.0643	$0.0199

With the exception of aluminium, the sale of recycled materials (operating income) is not a significant source of revenue generation. Unredeemed deposits and recycling fees are necessary to further fund operations.

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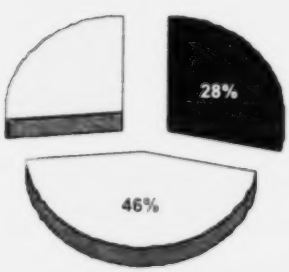

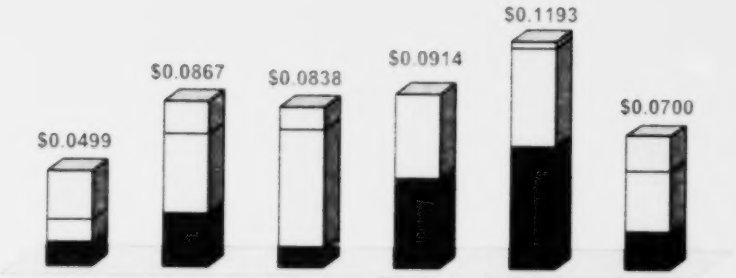

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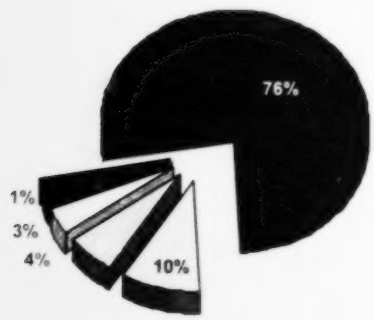
Aluminium Costs Half of Other Materials – Handling Commissions are Cost Drivers in all Categories

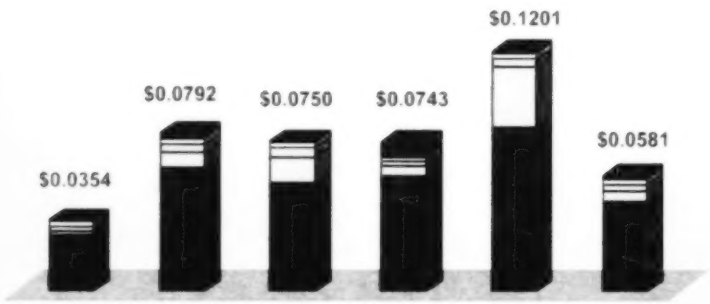
After deposit refunds have been allocated, expenses are driven primarily by the handling commissions paid to bottle depot operators (76.0%). The remaining 24% is allocated directly to materials processing (9.5%), transportation (6.2%), administration (3.9%), advertising and market development (2.6%), and to the BCMB as a regulatory transfer (0.7%).

When refunded deposits are not considered, the aluminium container stream is the least expensive to operate at ¢3.54 per container, with plastics, glass, and polycoat materials costing ¢7.92, ¢7.50, and ¢7.43 respectively. Bi-metal container recycling is by far the most costly of the material streams at ¢12.01. A noteworthy point is that the combination of operation income and the resale of aluminium materials generated ¢2.61 per container recycled – this high value has led to the abolition of the container recycling fee for this material type, effective February 1st, 2005. Historical prices of aluminium are included in Appendix C.

Exhibit 4-5 details the costing components by container material stream for non-beer beverage containers in 2004.

Exhibit 4-5
Expenditures for Non-beer Container Recycling by Material





	Aluminium	Plastics	Glass	Polycoat	Bi-Metal	Total
BCMB	$0.0005	$0.0005	$0.0003	$0.0005	$0.0005	$0.0004
Advertising & System Development	$0.0004	$0.0022	$0.0002	$0.0066	$0.0005	$0.0015
Administration	$0.0022	$0.0024	$0.0023	$0.0023	$0.0028	$0.0023
Transportation	$0.0024	$0.0050	$0.0051	$0.0026	$0.0040	$0.0036
Processing	$0.0021	$0.0073	$0.0124	$0.0045	$0.0303	$0.0055
Handling Commissions	$0.0279	$0.0618	$0.0547	$0.0579	$0.0821	$0.0448

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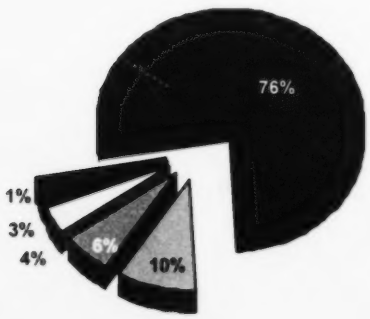

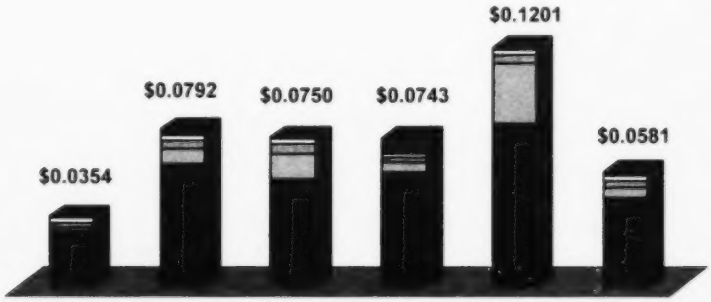

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4.1.5 RECOVERY PERFORMANCE

Table 4-1 exemplifies unit recovery rates for the number of beverage containers sold and recovered in 2004. It also highlights the program's speculative performance targets per container type.

Table 4-1
Unit Sales and Recovery for Applicable Beverage Containers – 2004

Material	Sold	Recovered	Recovery Rate	Target
Aluminium (Soft Drink)	478,279,000	385,454,619	80.59 %	85.0 %
Plastic	320,199,586	224,338,585	70.06 %	76.0 %
Glass	126,180,298	99,407,841	78.78 %	81.0 %
Polycoat	156,691,507	89,137,963	56.89 %	58.0 %
Bi-Metal	5,496,188	3,060,222	55.68 %	63.0 %
Aluminium (Beer)	347,855,112	316,553,556	91.00 %	92.0 %
Glass (Imported Beer)	48,591,648	45,602,580	93.85 %	97.0 %
Glass (Domestic Beer)	170,589,924	164,232,636	96.27 %	97.0 %

On a per unit basis, Albertans recycled a total of 80.28% of applicable beverage containers sold into the market in 2004. This number falls short of the agreed overall target of 85% recovery. Recovery rates by material type vary widely depending on the type of the beverage being consumed:

- **Traditional (soft drink)**—Sold in aluminium, plastic, and glass packaging, traditional containers attained recovery rates of 80.6%, 70.0%, and 78.8% respectively—due in large part to the consumer awareness because of their long-standing presence within the Albertan deposit program.

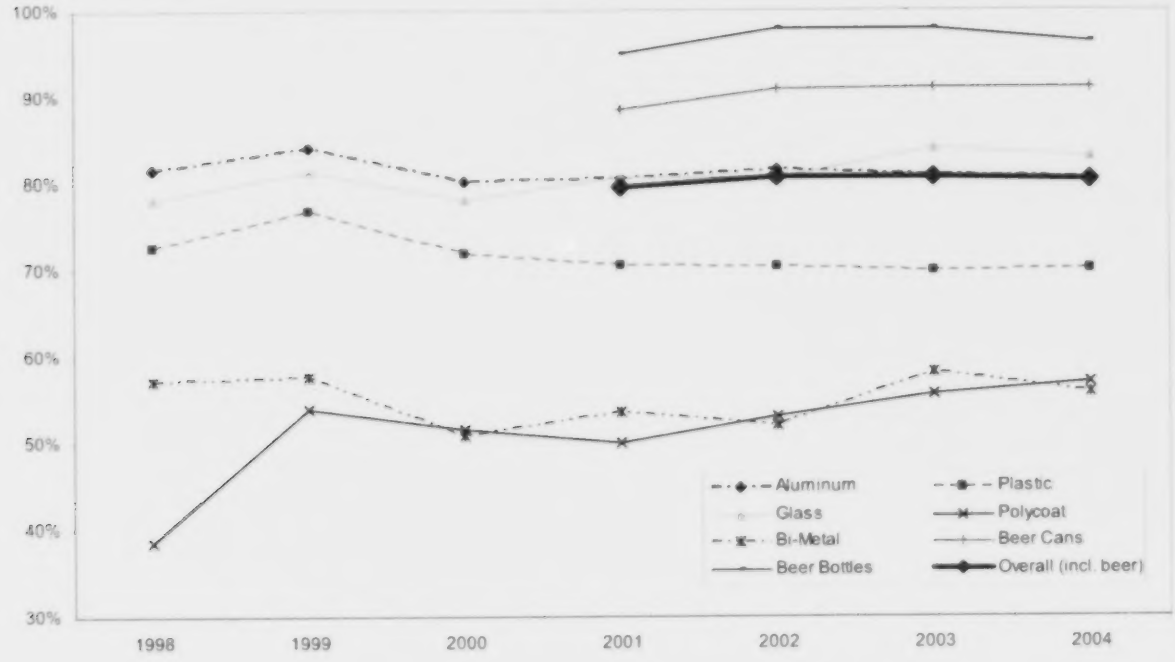
- **Beer**—Beer cans, domestic bottles, and imported bottles achieved 91.0%, 96.3%, and 93.4% recovery respectively in 2004. Alcoholic beverages sold in Alberta are regulated in terms of who may consume alcohol (those 18 years of age and older), and the conditions in which they may be consumed. Only licensed restaurant/bar establishments and retail vendors may sell the beverages, and they are subject to certain operating limitations (hours, etc.). This profile has allowed the beer industry to attain high recovery rates. Furthermore, domestic beer brandowners utilize a common refillable container (Industry Standard Bottle), and they therefore take a heightened stake in the recovery of this packaging type. ISB containers can be reused up to 20 occasions.

- **Non-traditional**—Non-traditional beverages and containers are drinks in packages that have recently been added to the deposit regime in Alberta. Confusion regarding the inclusion of aseptic (tetra brik), gable top (carton), and bi-metal containers in the program continues to exist seven years after the fact, particularly with the explicit exclusion of milk containers and non-beverage metal cans from the program (milk containers closely resemble gable top containers). Additionally, non-traditional beverages are often consumed outside the home, thereby triggering the need for readily available recycling alternatives in public places to avoid consumers from having to exert added energies to recycle products.

Alberta's Recovery Rates Have Plateaued

Exhibit 4-6 shows the historical performance of applicable container types since 1998, when non-traditional packaging was added to the program. Information for domestic beer containers is only included since 2001, when they were included within the scope of the program.

Exhibit 4-6
Historical Recovery Rate Performance for All Beverages



Beverage container recovery rates in Alberta have plateaued. Historically, rates have had insignificant growth other than continued management of annual market appreciation. Since 1998, with the exception of non-traditional containers, rates have regressed (1.0 and 2.4 percent for aluminium and plastic containers respectively). Non-traditional containers have seen marked growth since being incorporated into the program in 1998, but continue to exhibit poor overall recovery rates (< 60%).

Regardless of the performance for non-traditional beverage containers, the primary drivers affecting recovery rates remain traditional soft drink and beer containers. Thus, considerable improvement in aseptic and gable top recovery will affect overall recovery rates only in the magnitude equivalent to their total profile within the marketplace. Bearing in mind the stagnate nature of recovery rates over the course of the previous 6-7 years, it is conceptually possible that Alberta has reached the upper threshold of attainable recovery rates given the makeup of recovery mechanisms available and consumer behaviour within the province. This theory is supported by the comparison of similar programs discussed further in this chapter, where recovery rates have plateaued within a certain band.

4.2 OVERVIEW OF NORTH AMERICAN AND EUROPEAN BEVERAGE CONTAINER STEWARDSHIP PROGRAMS

4.2.1 OVERVIEW

In terms of environmental programs, beverage container recycling worldwide is typically quite mature with most programs in economically developed nations having been instituted over a decade ago (Table 4-2). Programs in different jurisdictions, however, continue to evolve to best align with changing program goals and objectives.

Table 4-2
Inception Dates for Benchmarked Programs and Deposit Programs of Interest

Jurisdiction	Inception	Comment	Jurisdiction	Inception	Comment
British Columbia	**1970**	Expanded '97	**Sweden**	**1984**	Deposit on Aluminium ('84) Deposit on PET ('94)
Alberta	**1972**	Expanded '97, '01	**California**	**1987**	Expanded '00 Deposit increased '89, '04
Oregon	**1972**		**New Brunswick**	**1992**	
Saskatchewan	**1973**	Expanded '99	**Yukon**	**1992**	
Vermont	**1973**	Expanded '91 to include liquor	**South Australia**	**1995**	Expanded '03
Michigan	**1978**		**Manitoba**	**1995**	
Maine	**1990**	Expanded '90	**Nova Scotia**	**1996**	
Iowa	**1979**		**Finland**	**1996**	Deposit on cans, refillables already in place
Connecticut	**1980**	Amended '86	**Newfoundland**	**1997**	
Delaware	**1982**		**Norway**	**1999**	Deposit on cans & non-refillable bottles
Massachusetts	**1983**		**Israel**	**2001**	
New York	**1983**		**Ontario**	**2002**	Many municipal programs est. mid-early 90s
Quebec	**1984**	Deposit for beer >450 ml raised in '01	**Germany**	**2003**	Triggered when market for non-refillables < 72%
Prince Edward Island	**1984**		**Hawaii**	**2005**	

Geography is an important factor to consider when differentiating between global beverage container recycling programs. Similarities are largely due to existing relationships between jurisdictions, comparable market conditions, and to a large degree the consumer culture of a jurisdiction. Equally, every program is unique in its own regard as it tailors itself to best meet the needs found in that particular jurisdiction. The following jurisdictions were identified as comparable programs, against which the effectiveness of Alberta's program could be benchmarked.

4.3 CANADIAN DEPOSIT PROGRAMS

Nationally, Canadian programs are typically defined by their inclusion of non-traditional beverage packaging and willingness to responsibly manage post-consumer beverage containers. Of the ten provinces and the Yukon Territory, nine deposit programs have been established, seven of which include the full scope of beverage container packaging (all excluding milk).

A second differentiator is that domestic beer recycling programs are generally managed solely on the part of the brandowners. This domain has remained largely unregulated and achieves substantial success in recovery rates, due in large part to deposit levels which are typically higher than average. Also worth noting is the sustained utilization of the Industry Standard Bottle (ISB) among domestic beer brandowners. The ISB can be refilled up to twenty times, reducing production and processing costs.

4.3.1 BRITISH COLUMBIA

The first Canadian jurisdiction to impose a beverage container deposit regime, British Columbia achieved an 81.7% recovery rate in 2004. The Ministry of Environment oversees the management of the program within which operate three stewardship organizations: Encorp Pacific Inc, who manages the collection of non-alcoholic containers through its network of 165 bottle depots (57% of the market); Liquor Distribution Branch, who sells alcoholic beverages at its licensed retail outlets and subsequently contracts Encorp Pacific to collect and process its containers (10% of the market), and; Brewers' Distributor Limited, who is responsible for collecting and processing the provinces domestic beer containers (33% of the market).

4.3.2 SASKATCHEWAN

Saskatchewan incorporates some of the highest deposit values in the country, allowing it to attain 89% overall recovery. Deposits of 10, 20, and 40 cents for various sizes of aluminium, plastic, and glass containers are a significant motivation to consumers to return applicable beverage containers. This has also led to a certain degree of containers being illegally imported into the province to take advantage of higher deposit rates. The Saskatchewan Association of Rehabilitation Centres – Recycling Division (SARCAN), under contract from the provincial government, administers the non-beer program. The government manages the handling of deposits, and retains the unredeemed deposits. The mission of the program differs from that in other jurisdictions in that it not only wishes to maximize container collection, but to also provide employment opportunities to persons with disabilities. Consumers may return beverage containers to one of SARCAN's network of 71 bottle depots.

4.3.3 QUEBEC

The Quebec program imposes deposits of 5 to 20 cents on beer and soft drink beverages sold in that province, and is overseen by the crown corporation Recyc-Quebec, who also oversees the waste management programs of other materials including scrap tires. Collection in the province occurs at retailers who sell the same products being return. In 1999, Boisson Gazeuses Environment (BGE) took over the role of administering the soft drink program on behalf of the soft drink industry (Recyc-Quebec continues to manage non-refillable beer containers). Non-traditional beverage packaging is managed in Quebec by municipal programs. Accurate financial information was not available as it is withheld by the brandowners who manage the program.

4.3.4 NEW BRUNSWICK

New Brunswick administers its program through its Department of Environment who delegates the collection and management for non-alcoholic beverage containers to Encorp Atlantic, who acts on behalf of brandowners. The New Brunswick Liquor Commission is the entity who acts on behalf of alcoholic beverage brandowners. The program is funded using the half-back model that redeems only a portion of the deposit value paid to consumers when containers are returned to one of the province's 83 depots. Considerable cross-subsidization occurs within the program to achieve its 82% recovery rate and ensure the continued financial viability of the program.

4.3.5 NOVA SCOTIA

The Resource Recovery Fund Board is the body that oversees the management of beverage container recycling in Nova Scotia. The multi-material board was implemented in 1996, and mandated to administer solid waste management in the province of materials including scrap tires, derelict vehicles, and household hazardous waste. Consumers are entitled to half of their deposit value paid at the point of purchase upon redemption of empty containers at one of the province's 82 redemption depots. The program achieved 79% recovery in 2004/05.

4.3.6 PRINCE EDWARD ISLAND

The program in PEI is limited to refillable beer and carbonated flavoured beverage containers. Industry brandowners and the province's Liquor Control Commission manage the program. Recovery rate estimates are unverifiable but it is commonly accepted that the province maintains a 98% recovery rate. Deposits are typically higher than those in other jurisdictions, but refunds are only a portion of what was initially paid in deposit value, as per the half-back funding model.

4.3.7 NEWFOUNDLAND & LABRADOR

Being the most recent of the nation's deposit regimes, the province continues to adjust and develop its program to best meet the needs of the region. The Multi-Materials Stewardship Board is the organization responsible for managing the recovery of beverage container in that province, and in 2004 it achieved at recovery rate of 67% for non-refillable containers and 77% for all beverage containers in the province. The unique geography and demographics in the province make recovery both difficult and costly. The program is funded using the half-back principle.

4.3.8 YUKON TERRITORY

Yukon's beverage container program is administered by the Department of Environment. Deposits are collected by the Recycling Fund and used to fund recycling processors, pay handling commissions, and promote recycling. The Fund is separate from the territory's general fund. Consumers can return containers for a partial refund (half-back) at liquor stores in communities outside of Whitehorse and at a redemption depot in the capital. Data for the program is historical, as recent statistics have been delayed by the territory's approval process.

4.4 AMERICAN DEPOSIT PROGRAMS

Of the 50 U.S. states, eleven have implemented so-called "bottle deposit law" legislation, requiring a deposit to be imposed on the sale of beverage containers at the point-of-sale. These programs have been shown to recycle more beverage containers than the remaining states combined. Defined by the return-to-retail recovery mechanism, and state willingness to escheat unredeemed deposits, America is best categorized by its focus on traditional beverage containers. This may be attributed to resistance to update legislation due in part to the strength of brandowner lobbyists in bottle bill states.

Programs operated in the United States closely adhere to the capitalist philosophy and are typically operated by individual industry brandowners. Recovery statistics and financial data are commonly closely guarded proprietary information, and only shared if required by law. In many cases the integrity of figures may be questioned as they may not be recent, or the overseeing agency lacks the authoritative power to audit the numbers in question.

4.4.1 CALIFORNIA

California is one of two American state-run programs. The initiative originated in 1989 and was expanded in 2000 to include several non-traditional packaging types. The magnitude of the demographic served within the jurisdiction inherently triggers many economies of scale which allows for significant investment towards tailoring the ideal return mechanism mix for communities. The Department of Recycling's current mix includes a combination of redemption depots, stand-alone automated Reverse Vending Machines, as well as return-to-retail and curbside options where applicable.

4.4.2 CONNECTICUT

The state of Connecticut imposes a deposit on all brandowners of beer and carbonated beverages of 5 cents and requires brandowners to pay a handling fee of 1.5 and 2 cents for beer and soft drink containers respectively. Consumers can return empty beverage containers to any retailer selling the same brand or to one of the state's 20 redemption depots. A significant RVM component is included in the recovery mix in the state and non-traditionals are recycled through municipal curbside programs. No recent statistics are available regarding the recovery of beverage containers.

4.4.3 DELAWARE

The 5 cent deposit on beer and soft drink containers applies to all containers with the exception of aluminium cans (accounting for approximately 50% of containers sold). Consumers return containers to retailers or redemption depots for a full refund, or they may include them in one of the states 144 voluntary drop-off depots or curbside programs (with forfeiture of the deposit). Retailers and collectors of beverage containers are entitled to a handling commission of 20% of the deposit value (1 cent) from brandowners. No recent statistics are available regarding the recovery of beverage containers.

4.4.4 HAWAII

Newest of the American states to implement a deposit regime (January, '05), Hawaii has already observed marked success over its previous recovery mechanism. Attaining roughly 52% recovery for the first 8 month period and 80% for the month of July (previously estimated at 20%), the state-run program to date has been largely successful. The program includes all beverage containers with the exception of milk containers, wine bottles, and spirits. As the

program is state-run, unredeemed deposits become the property of the state and are used to fund the program, or are escheated to be used towards other environmental programs.

4.4.5 IOWA

The state program is mature, as it has been operational since 1979, and covers carbonated soft drinks, as well as alcoholic beverages. The 5 cent deposit motivates consumers to return empty containers to retailers or to 153 redemption depots (a retailer may refuse to provide refunds if they are within close proximity of a certified depot). Handling commissions in the state are set at 1 cent, and RVMs are employed at locations throughout the state. 1996 was the last time the soft drink association provided data to the state voluntarily and it was determined that roughly 92% of beverage containers were being returned. More recent estimates peg the figure at 93% (2003), but without specific reporting requirements, these figures cannot be validated.

4.4.6 MAINE

The state of Maine was the first to expand its legislation to include juices, teas, sports drinks, bottled water, and wine and liquor. Aseptic packaging was banned in 1990, but reinstated in 1994. A structured deposit scheme requires a 5 cent deposit for all applicable beverage containers, with wine and liquor containers requiring a further 10 cents (15 cents total). Handling commissions were raised to 3.5 cents in 2004 and are structured to reflect whether or not the containers collected are commingled or not (if a commingling agreement is in place, brandowners reduce the handling commission by a half cent). Consumers may return containers to either retailers or redemption depots. The soft drink industry judges the actual recovery rate to be between 93-95%, but without reporting requirements, these numbers are unverifiable. Unredeemed deposits become the property of the state

4.4.7 MASSACHUSETTS

The program has been recycling beer and soft drink containers since 1983 with a deposit value of 5 cents. Massachusetts has achieved recovery of 69.4% in 2004, with consumers returning containers to retailers or 121 redemption depots. Efforts have been taken to expand the accessibility of recycling options in public places; including small receptacles attached to garbage cans in community parks so consumers do not dispose of containers, but rather leave them to be collected by street people, who themselves inherit the deposit value. Massachusetts is one of the few states that require brandowner wholesalers to report sales and recovery statistics monthly. This control also allows the state to collect unredeemed deposits, which it escheats into environmental programs and its general fund. A portion of these escheats is used to subsidize certain collection program, charities and depots. In 2004 these grants directly contributed to the collection of 342 million containers at a cost of US$0.0037 per container. Handling commissions in the state are set at 2.25 cents per container, payable by brandowners. Reverse vending machines are widely deployed throughout the state.

4.4.8 MICHIGAN

Michigan has a higher deposit value than other states (10 cents), and includes beer and carbonated soft drinks. The return mechanism is entirely return-to-retail, with expanded technological infrastructure found in reverse vending machines. At 97%, the program is a leader, and attributes its success in part due to its higher deposit level. Beverage container litter has been virtually eliminated from the state and is very popular among state residents. It is noteworthy that the recovery rate is calculated based on total deposits received and total deposits refunded, and does not account for illegally returned containers imported from other jurisdictions. Unredeemed deposits are divided amongst the government (75%) and retailers (25%), with the escheats going to the Cleanup and Redevelopment Trust Fund (10% of

which is retained in trust until a maximum of $200 million is attained). The portion allocated to retailers is intended to cover handling expenses incurred by retailers in collecting applicable beverage containers.

4.4.9 NEW YORK

The state-wide deposit program was implemented in 1983 to cover beer, soft drinks, and wine coolers. At 69%, the program calculates returns as a function of deposits received and deposits refunded as reported by brandowners. There is a certain degree of scepticism as regarding the accuracy of these figures as the state Department of Environmental Conservation does not hold the power to audit the system. The 5 cent deposit is recoverable at redemption depots and retailers, and a 2 cent handling fee is charged to brandowners. Currently there is a push to update the legislation in the state, with proposed amendments considering an expansion of the program to include non-carbonated beverages like juices, teas, and bottled water. Also the state is considering whether or not to escheat unredeemed deposits, which are currently retained by brandowners, and divert them to other environmental programs.

4.4.10 OREGON

The program in Oregon was implemented in 1972, and has done little to update the program since inception. The return-to-retail model is currently employed to recover beer and soft drink beverages. Recent estimates (2002) put the program recovery rate at 78%, with an additional 4-5% potentially being recycled through municipal programs. No handling commissions are imposed in the state and brandowners retain the unredeemed deposits on standardized refillable (2 cents) and non-refillable or non-standardized (5 cents) beverage containers.

4.4.11 VERMONT

Vermont imposes a 5 cent deposit on all beer and soft drink beverages, and a 15 cent deposit on mixed wine and liquor drinks. Consumers are entitled to a full refund of containers at retailers or redemption centres; however retailers may refuse to redeem deposits if it is located conveniently near a redemption centre. Handling fees in the state have been raised to 3 cents per container, thereby inciting many redemption depots to begin operations, making recycling extremely convenient for consumers. Brandowners are not required to report collection statistics to the state, thus estimates of 90% recovery are not reliable.

4.4.12 OTHER

Currently several other jurisdictions are contemplating deposit regimes in an effort to increase recovery rates and waste diversion. Jurisdictions include:

- Arkansas
- Idaho
- Illinois
- Mississippi
- Montana
- New Hampshire
- Tennessee
- Utah
- Washington State
- West Virginia

4.5 INTERNATIONAL DEPOSIT PROGRAMS

Many other programs exist globally, with programs established widely in Scandinavia, to localized programs in Europe, Australia, and abroad. Scandinavian and other European programs are characterized by 1) industry participation through common brandowner organizations who collectively share the responsibility of recycling beverage containers, 2) a willingness to invest in technologies to improve system efficiencies, and 3) utilizing a high percentage of refillable beverage containers (including glass and PET plastic).

4.5.1 SWEDEN

AB Svenska Returkpak is the industry organization that collects and recycles non-refillable (one-way) aluminium and PET plastic containers. Owned in part by the packaging industry, trade organization, and the Swedish Brewers Association, the company operates on a not-for-profit basis. Consumers can return applicable containers to retailers who use, to a large degree, automated reverse vending machine technology. Handling fees are also structured to provide retailers incentive to use RVMs. The program for aluminium and PET container recycling recovered about 82.5% of the containers sold in 2004.

4.5.2 NORWAY

Co-owned by the Federation of Norwegian Commercial and Service Enterprises, Coop Norway, Norwegian Association of Wholesale Grocers, Norwegian Federation of Petrol Dealers, The Norwegian Brewers' Service Office, Grocery Manufacturers' Service Office, and the Federation of Norwegian Food and Drink Industry, the Norwegian model has many distinct differences from other deposit programs. The first difference being the imposition of a sliding levy paid by consumers at the point-of-sale of products. The levy is determined based on annual recovery rates and provides brandowners and consumers alike an incentive to increase container returns. Secondly, the program has many stewardship corporations, each representing a distinct package type. Finally, Norsk Resirk, the stewardship organization managing the recovery of non-refillable aluminium and PET plastic containers, invests significantly in market development, including Reverse Vending Machine technology and advertising – including the endorsement of national singer/songwriter to participate in an add campaign. Approximately 88% of refunds occurred through Reverse Vending Machines and 89% of the total volume sold was recovered in 2004.

4.5.3 FINLAND

The principal makeup of the Finnish market for beverage containers is refillable glass bottles. Deposits on refillable bottles are a legacy of the Finnish beer monopoly (disbanded in 1995 with E.U. membership), and have persisted to this day as an effective mechanism for recovering post-consumer containers. Aluminium cans have appeared increasingly in the market mix, and have been subject to deposit since 1996. Recovery rates for Finnish refillable bottles are estimated at 98%, while aluminium containers are collected at a rate of 82%. Approximately 90% of can collection occurs through one of the countries 2400 Reverse Vending Machines.

4.5.4 GERMANY

Implemented in 2003 as a result of an environmental directive stating that the market share for refillable containers must exceed 72%, otherwise a deposit regime will be imposed on non-refillable containers. The program will initially target beer and carbonated soft drink containers, and will be expanded to include non-carbonated drinks, sports drinks, teas, and juices effective May 1st, 2006. Non-traditional packaging (aseptic and gable top), wine, and spirits will not be included in this program.

4.5.5 SOUTH AUSTRALIA

Originally modeled on the Oregon system, the South Australian program for recovering beverage containers now more closely resembles the deposit regime in Alberta, with the distinction that brandowners have organized themselves into four 'super-collectors' who are responsible for collecting beverage containers from depots (99%) or retailers (1%). Consumers are allowed to return containers to either depots or retailers, as indicated on the container, but not both. This is a competitive industry where most information is considered proprietary and is thus not made public.

4.5.6 OTHER

Other programs exist including a handful of other European programs, as well as known programs in Israel, India, and Brazil. Further jurisdictions, like Japan, have experimented with voluntary deposit programs. These programs could not be benchmarked, as the scope of the study was limited and intended to focus on those programs comparable to Alberta.

4.6 CANADIAN NON-DEPOSIT PROGRAMS

A handful of non-deposit regimes have been established across the country in recent years. These programs contend to be cost-effective mechanisms in accomplishing waste diversion of designated recyclable materials and target materials beyond beverage containers. The basis for these programs is that economies of scale should be generated through increased overall collection, processing, and waste diversion. To date estimations show that recovery rates for beverage containers lag in these programs when compared to those achieved in deposit-regimes. A thorough examination of Ontario's program is detailed later in this chapter.

4.6.1 MANITOBA

The governance body in the province is the Manitoba Product Stewardship Company (MPSC), which operates at arm's length from the government. Its mandate is to manage the distribution of support payments among those provincial municipalities recycling consumer materials. The program is unique in that the funds are generated solely from the 2 cent environmental levy charged to consumers at the point of sale for every beverage container sold. The funds are dispersed to fund approximately 80% of net municipal costs to recycle all applicable materials. The remaining portion is funded through municipal taxation. It is estimated that 63% of beverage containers are recycled in 2004-05 (51% excluding domestic beer recycling).

4.6.2 ONTARIO

The Waste Diversion Act (2002) established Waste Diversion Ontario (WDO). WDO is the authority responsible for managing the waste diversion for a wide range of designated materials, including beverage container packaging, other post-consumer packaging, waste electronics, and scrap tires. The province does not employ a deposit regime, but rather an industry compensation regime where brandowners pay a designated fee based on material weight to an Industry Funding Organization (IFO), who is the responsible to act on behalf of brandowners. The 2005 fee schedule is included in Appendix D. The IFO in Ontario is Stewardship Ontario and is responsible to collect applicable fees and negotiate with WDO and municipalities to agree on annual net costs, 50% of which are to be funded by brandowners. It is estimated that 55% of all beverage containers sold were returned in 2004 (41% excluding Beer Store and LCBO returns).

4.6.3 QUEBEC

Non-traditional beverage containers are managed separately from soft drink and beer containers included in the deposit regime. The provincial curbside recycling program is being rolled out in 2005 and closely resembles the industry compensation regime utilized in Ontario where product stewards are responsible to reimburse municipalities 50% of their net cost to recycle. Stewards pay fees to an Industry Funding Organization (Collecte Séléctive Québec) according to fee schedules. Once agreed to, the IFO pays an appropriate level to Recyc-Quebec that disperses funds among municipalities. There is the potential under this regime to harmonize fee schedules with that used in Ontario. Program specifics are currently being finalized with program implementation expected to occur in early 2006.

4.7 GOVERNING STRUCTURE

Globally, numerous mechanisms and models exist for the management of used beverage container packaging. No two programs are identical, however many similarities do persist and are helpful in defining distinctive characteristics. The primary variables which exist within most recycling programs can be limited governance, recovery, and funding models.

- **Governmental Administrative Agency** – Typically programs being publicly administered are managed under the umbrella of an Environmental Ministry or equivalent department within the government. Stakeholder participation is limited to input and collaboration between relevant agents with no direct influence on the decision-making process from industry and the public.

- **Delegated Administrative Organization** – Administered at arm's length from the government, a delegated administrative organization (DAO) is given the authority to impose certain requirements on the agents within a recycling system. DAO's are unique in that they afford an opportunity for multi-stakeholder participation from sectors including, industry, government, and the public-at-large through appointments to the Board of Directors.

- **Producer Responsibility Organizations** – In some instances where legislation is enacted to require industry to meet certain recycling requirements without direct involvement on the part of the government, industry has organized itself collaboratively to best manage its obligations under the legislation. Decision making is taken in the best interest of the participant companies, who are compelled to meet their legislated duties.

Table 4-3 illustrates how programs of interest differ by governance model.

Table 4-3
Governance Models Used Within Programs of Interest

Governmental Administrative Agency	Delegated Administrative Organization	Producer Responsibility Organization
New Brunswick	Alberta	British Columbia
Yukon	Saskatchewan	Finland
California	Manitoba	Norway
Hawaii	Ontario	Sweden
Connecticut	Quebec	Germany
Delaware	Nova Scotia	
Iowa	Newfoundland	
Maine	Prince Edward Island	
Massachusetts		
Michigan		
New York		
Oregon		
Vermont		
South Australia		

4.8 RECOVERY MECHANISM

Two principal regimes exist in recovering beverage containers world-wide, each having variants of the primary model.

- **Non-Deposit Regime** – Recycling within non-deposit regimes rely on the consumer-responsibility model, where activities are largely driven by the voluntary participation of consumers. Non-deposit recycling programs typically don't differentiate between beverage container packaging and other consumer product packaging materials and therefore can leverage system efficiencies from one-another. Two principal variants exist within this model:

  - **Drop-off** – The simplest of the recovery mechanisms, a drop-off program relies on the voluntary participation of the public to return recyclable materials to designated collection points. Usually, depots are located at centralized locations, with separate industrial-sized bins being setup to collect common materials. Consumers are expected to separate materials, thereby reducing sorting requirements downstream at processing facilities. Drop-off programs also have the added benefit of scalability – adding materials at relatively minimal marginal cost.
  - **Curbside Collection** – Curbside collection, commonly referred to as Blue Box Programs, provide the added convenience of materials pick-up, normally from the consumer's place of residence. Regularly scheduled (weekly or bi-weekly) pick-up occurs by specially equipped transporters who collect designated materials. Efficiencies can be realized within curbside programs due to the large scale and potentially wide-ranging scope opportunities. Materials normally included for collection under these regimes are aluminium and steel cans, as well as glass and PET containers, and newsprint. The inclusion of other optional materials including HDPE and other plastics rely on the processing capabilities available within the jurisdiction.

- **Deposit Regime** – A deposit system is predicated on the consumer-incentive model, where purchasers of beverage containers are motivated to return empty containers to collection points by the promise of compensation upon return. Two principal variants exist within this model:

  - **Depot** – Similar to the drop-off concept, with the added complexity of a service component, depots are used to support deposit systems. Workers count and sort containers for consumers, refund deposit values, and collect materials for downstream processing. Depots have a large workforce component, thus costs are driven by labour requirements.
  - **Return-to-Retail** – This system obliges retailers who sell a beverage product to accept empty containers and refund deposit values to consumers. Instituted to support deposit systems, return-to-retail collection offers consumers many accessible recovery points, but often in limited quantities as most retailers do not have the required storage space to handle containers in excess. Retailers attempt to realize transportation efficiencies by having brandowner distributors remove containers when they restock products. Technological alternatives also have presented themselves under this model with the advent of reverse vending machines, which are used to automate certain tasks including sorting, counting, and compacting beverage containers.

Table 4-4 illustrates the mix of recovery mechanisms within benchmarked programs. Non-deposit regimes are much more common in many regards, as only 11 of 50 U.S. states have deposit legislation.

Table 4-4
Employed Recovery Mechanisms Throughout Benchmarked Programs

Deposit Regime	Depot	Return-to-Retail	Non-Deposit Regime	Drop-off	Curbside
Alberta	√	O	Manitoba	√	√
British Columbia	√	√	Ontario	√	√
Saskatchewan	√		Quebec (non-traditionals)	√	√
Manitoba		O			
Ontario (beer)		O			
Quebec		√			
New Brunswick	√	O			
Nova Scotia	√	O			
Prince Edward Island	√	√			
Newfoundland	√	O			
Yukon	√				
California	√	!			
Connecticut	√	!			
Delaware		√			
Hawaii	√	√			
Iowa	√	!			
Maine	√	√			
Massachusetts	√	!			
Michigan		!			
New York	√	!			
Oregon		√			
Vermont	√	!			
South Australia	√	√			
Finland		!			
Norway		!			
Sweden		!			
Germany		!			

√– Currently used in program
O – Domestic beer returns in Canada
! – Includes Reverse-Vending Machines (RVM)

4.9 FUNDING MECHANISM

- **Deposit Value** – As earlier described, a deposit regime provides consumers with an incentive to return beverage containers to collection points by the promise of compensation upon their return. The percentage of unreturned containers equates into a value of unredeemed deposits, which is often retained to cover the cost of recycling, but is sometimes escheated into the general coffers of the applicable government body for use in other environmental programs and sometimes entirely unrelated programs.

- **Recycling Levy** – A recycling levy is a non-refundable fee imposed on beverage container sales at the point-of-purchase. Funds recovered using a recycling levies (or environmental recycling fee) are typically used to offset or subsidize the cost of recycling applicable materials under the program.

- **Halfback System** – Some jurisdictions have imposed a half-back system instead of imposing a recycling levy to finance their programs. Refunding only a partial value of the deposit paid by consumers, usually 50%, the benefit of this system comes into consideration when a governing body lacks the authority to impose a recycling levy, which is often considered a tax – and only government may impose a tax.

- **Sale of Recyclable Materials** – A significant portion of the expenses incurred to recycle containers is covered through the sale of processed materials. Markets for various materials are diverse, with markets for recycled aluminium being the most lucrative – and the only material that mostly offsets the costs incurred to recycle it.

- **Stewardship Fee** – Imposing stewardship fees requires industry to directly contribute to the cost of recycling the packaging of their products. Brandowners pass the fee on to consumers. The fee itself is calculated as a function of package weight using a collectively agreed upon fee schedule.

- **Taxation** – Taxation is a funding alternative generally used to finance non-deposit regimes. With municipalities and townships being the authorities responsible for collection and processing under their waste management services, costs are covered through property taxes and other revenues realized through waste management services such as landfill tipping fees. The taxation model deviates from the user-pay model and requires tax-payers to contribute proportionally regardless of consumption patterns.

- **Escheats** – The rights to unredeemed deposits and system surplus is significant in that it often equates to millions of dollars. In most instances the recycler or recycling program retains these funds to offset the cost of recycling, but in certain instances the government collects the surplus. Used for the purpose of funding programs (often environmental) outside of beverage container recycling this leakage may be interpreted as additional taxation.

Program objectives and challenges differ from one jurisdiction to the next and are important factors in selecting the appropriate beverage container recycling mechanism to apply. Table 4-5 illustrates the different recovery models used worldwide. It cannot be mistaken that recovery rates observed in jurisdictions incorporating deposits far exceed those attained in non-deposit systems.

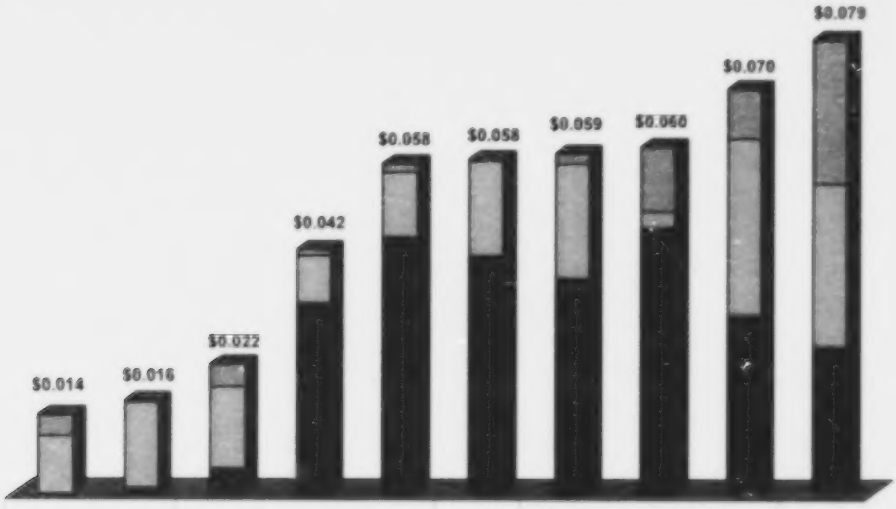
Table 4-5
Program Funding Sources within Benchmarked Jurisdictions

Jurisdiction	Deposit	Recycling Levy	Steward Fee	Taxes	Comment
Alberta	√	√			
British Columbia	√	√			
Saskatchewan	√				Program is funded by a Govt grant, surplus is escheated
Manitoba		√		√	2 cent levy subsidizes provincial recycling program
Ontario			√	√	Stewards are required to pay 50% of net municipal recycling cost
Quebec	√	√	O	O	Stewardship fees will be imposed effective March, 2005
New Brunswick	√				Half-back system, Escheats
Nova Scotia	√				Half-back system
Prince Edward Island	√				Half-back system
Newfoundland	√				Half-back system
Yukon	√				Half-back system
California	√				Unredeemed deposits are escheated and used to pay for environmental programs
Hawaii	√	√			Only U.S. State to impose a levy, escheats to fund program
Connecticut	√				
Delaware	√				
Iowa	√				
Maine	√				Escheats
Massachusetts	√				Escheats to the state's Clean Environment Fund
Michigan	√				75% escheats to Environmental Trust Fund
New York	√				Currently evaluating escheats to help fund municipal recycling
Oregon	√				
Vermont	√				
South Australia	√				
Finland	√				
Norway	√	√			Govt imposes a sliding scale tax based on container recovery rate
Sweden	√				
Germany	√				

4.10 PERFORMANCE

Exhibit 4-7 reflects those benchmarked jurisdictions that made financial data available. The information presented reflects the efficient operation of Alberta's transportation, processing, and administrative operations, and concurrently exhibits the significant magnitude of its average handling commissions.

Exhibit 4-7
Financial Performance Throughout Benchmarked Programs



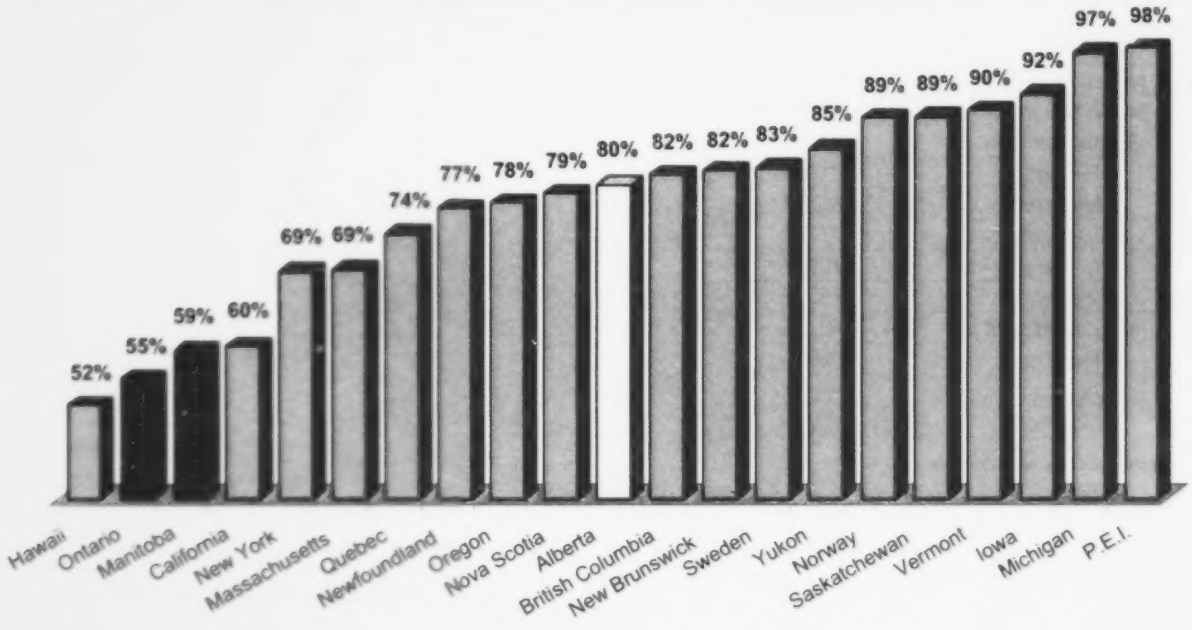
	Manitoba	Ontario	California	Nova Scotia*	Alberta	Sask.	British Columbia	Sweden	Nfld.	Norway
System Development & Marketing	$0.004	$0.000	$0.004	$0.001	$0.001	$0.000	$0.002	$0.011	$0.009	$0.025
Transportation, Admin., Processing	$0.010	$0.015	$0.014	$0.008	$0.011	$0.016	$0.020	$0.003	$0.031	$0.028
Avg. Handling Commissions	$0.000	$0.001	$0.004	$0.033	$0.044	$0.041	$0.037	$0.046	$0.031	$0.026

**Processing cost unavailable*

The figures for Norway and Sweden have been adjusted to reflect the purchasing power parity (PPP) of those two countries. PPP is an accepted methodology to reflect the actual costs incurred when comparing between international jurisdictions, as it considers domestic costs to consumers and discounts fluctuations on global currency markets. This practice is further described in the following chapters.

Recovery rates observed in jurisdictions incorporating deposits far exceed those attained in non-deposit systems. Exhibit 4-8 distinguishes deposit regimes (brown) from non-deposit regimes (black), and it is widely accepted that potential recovery rates in non-deposit systems may only attain 50-60% recovery, while deposit systems can achieve recovery rates into the high 90s.

Exhibit 4-8
Overall Program Recovery Rates Throughout Benchmarked Jurisdictions



On either ends of the continuum are outliers reflecting differences in the program. Hawaii, at the low end, is in the infancy of its program that began in 2005, and at the high end, limited program scopes and higher deposit values affect performance. The high-end outliers often cannot verify data, which is therefore unreliable.

Both Blue Box programs studied (Ontario and Manitoba) report an aggregate recovery rate by packaging material that also considers non-beverage container packaging. Estimates were derived assuming consistent recovery across material type, which is considered the best estimate possible.

Table 4-6
Aluminum Recovery Rates

Aluminium	
Jurisdiction	**Recovery Rate**
Saskatchewan	94.5%
Norway	92.0%
Switzerland	91.0%
Sweden	86.0%
New Brunswick*	84.0%
British Columbia*	83.8%
South Australia	82.0%
Finland	81.8%
Alberta*	**80.6%**
Nova Scotia*	77.8%
California	75.4%
Quebec*	75.0%
Newfoundland*	68.6%
New York	60.8%
*Manitoba**	*43.0%*
*Ontario**	*40.8%*

* Denotes non-beer recovery rates

Aluminium Recovery is Average

For aluminium container recycling, Alberta's performance is well within the range of leading jurisdictions in terms of recovery. Of note is the leading four jurisdictions do not differentiate between non-beer and beer containers. Alberta's recovery rate when considering all aluminium containers (beer & non-beer) becomes 85%.

Table 4-7
Plastics Recovery Rates

Plastics	
Jurisdiction	**Recovery Rate**
Saskatchewan	86.3%
New Brunswick	81.0%
Nova Scotia	78.0%
Sweden	78.0%
Norway	77.0%
British Columbia	73.4%
Quebec	72.9%
Switzerland	71.0%
Alberta	**70.1%**
Manitoba	*68.1%*
Newfoundland	64.4%
South Australia	64.0%
Ontario	*50.1%*
California	39.3%

Plastics Lagging when Compared to Leaders

Alberta ranks in line with many comparable jurisdictions in the recovery of plastic beverage containers, but this is a category with significant opportunity. Recovery rates in Saskatchewan are 16% greater than those in Alberta.

Tablvo

a division of Alberta Recycling Management

Aluminium & Plastics	
Jurisdiction	**Recovery Rate**
Saskatchewan	91.3%
Norway	88.7%
British Columbia	83.1%
Sweden	82.6%
Alberta	**80.8%**
Nova Scotia	77.9%
Quebec	73.8%
New York	69.0%
Newfoundland	66.9%
California	60.5%
Manitoba	*57.3%*
Ontario	*45.8%*

Traditionals Performance are Comparable

When aggregating aluminium and plastics container streams, Alberta ranks well in performance, with three of the four jurisdictions having greater recovery rates also incorporating higher deposit values.

Table 4-9
Polycoat Recovery Rates

Polycoat	
Jurisdiction	**Recovery Rate**
Nova Scotia	87.2%
Newfoundland	71.3%
Norway	*57.0%*
Alberta	**56.9%**
British Columbia	56.2%
Saskatchewan	55.7%
New Brunswick	51.0%
Manitoba	*45.0%*
South Australia	43.0%
Ontario	*9.6%*

Polycoat Recycling is Challenging for Most Programs

Polycoat container recycling in Alberta is an area of significant opportunity. Few jurisdictions have been able to effectively incorporate these containers into their programs, and consumer awareness is seen to be a potential source of this result. Consumer behaviour may also contribute to poor recovery, as a great deal of polycoat consumption happens outside of the home in public places.

Table 4-10
Glass Recovery Rates

Glass	
Jurisdiction	**Recovery Rate**
Prince Edward Island	98.0%
Saskatchewan	89.3%
South Australia	86.0%
British Columbia	84.1%
Alberta	**83.0%**
Nova Scotia	79.5%
New Brunswick	76.0%
Newfoundland	62.0%
Quebec	59.6%
Ontario	*58.7%*
California	56.2%
New York	56.0%
Manitoba	*35.0%*

Glass Recycling Performing Well

Glass recovery in Alberta rates well when compared to similar jurisdictions. Prince Edward Island is the leader in this category, as it requires all beverage containers within the scope of the program to be in refillable containers. Figures in PEI cannot be verified, although they are widely accepted.

Table 4-11
Bi-Metal Recovery Rates

Bi-Metal	
Jurisdiction	**Recovery Rate**
Saskatchewan	94.5%
Nova Scotia	87.2%
Newfoundland	59.9%
Alberta	**55.7%**
Ontario	*52.7%*
British Columbia	52.7%
New Brunswick	51.0%
Manitoba	*39.0%*
California	4.6%

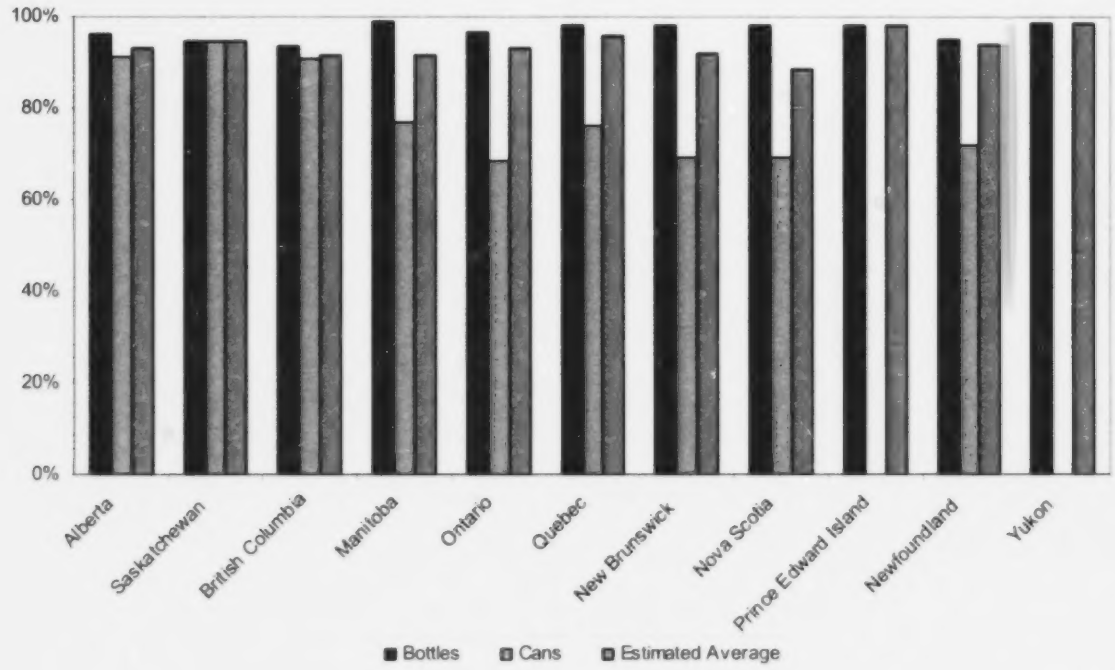
Low Bi-metal Recovery Common

Bi-metal cans are also a category experiencing lower recovery rates with low consumer awareness and participation being a potential factor in this result. Confusion may also exist with similar non-beverage containers being included in community recycling programs and not deposit programs. These containers account for 0.3% of the sales that occur in the province; therefore bi-metal recovery is considered an area of opportunity with low impact to the overall program.

Canadian Domestic Beer Recovery Consistent Nationwide

Exhibit 4-9 illustrates recovery rates for domestically produced beer by jurisdiction as reported by the Brewers Association of Canada. Nationwide recovery rates for beer bottles are quite high, with aluminium containers also experiencing relatively strong recovery rates.

Exhibit 4-9
Canadian Domestic Beer Recovery Rates



4.11 DEPOSITS VALUES

A deposit is an amount of money a consumer pays down at the point-of-sale on applicable beverage containers, and is later refunded (partially in the half-back system) upon redemption of the empty container. Deposits world-wide vary by geographic area as can be seen in Table 4-12, but generally only represent a minor portion of the sale value of the beverage.

Table 4-12
Deposit Levels in Benchmarked Programs

Jurisdiction	Local Deposit	$CDN	Type	Comment
CANADA				
Alberta	**Non-beer** 5¢ < 1 L 20¢ > 1 L **Beer** 10¢ < 1 L 20¢ > 1 L		**Structured**	Full Refund for all Deposits
British Columbia	**Non-beer** 5¢ < 1 L 20¢ > 1 L **Beer** 10¢ < 1 L 20¢ > 1 L		**Structured**	Full Refund for all Deposits
Saskatchewan	**Aluminium/Plastic** 10¢ < 1 L 20¢ > 1 L **Glass** 10¢ < 300 ml 20¢ < 900 ml 40¢ > 1000 ml **Polycoat** 5¢ all sizes **Beer** 10¢ < 1 L 40¢ > 1 L		**Structured**	Full Refund for all Deposits Highest Canadian Deposit Values
Manitoba	**Beer** 10¢ < 1 L 20¢ > 1 L		**Structured**	Deposits on Beer – Returned to retailers
Ontario	**Beer** 10¢ < 1 L 20¢ > 1 L		**Structured**	Deposits on Beer – Returned to retailers
Quebec	**Non-beer** 5¢, soft drink **Beer** 5¢, cans < 450 ml 20¢, cans > 450 ml 10¢, bottles < 450 ml 20¢, bottles > 450 ml		**Structured**	Deposits of Traditional Beverages only
New Brunswick	**Non-alcoholic** 10¢, all **Wine/Spirits** 10¢ < 500 ml 20¢ > 500 ml **Beer** 10¢ < 1 L 20¢ > 1 L		**Structured**	Half-back system

Table 4-12
Deposit Levels in Benchmarked Programs continued

Jurisdiction	Local Deposit	$CDN	Type	Comment
CANADA				
Nova Scotia		**Non-alcoholic** 10¢, all **Wine/Spirits** 10¢ < 500 ml 20¢ > 500 ml **Beer** 10¢ < 1 L 20¢ > 1 L	**Structured**	Half-back system
Prince Edward Island		**Non-alcoholic** 20¢ < 500 ml 40¢ < 1.50 L 80¢ >1.50 L **Wine** 10¢ < 500 ml 20¢ > 500 ml **Beer** 10¢, all	**Structured**	Half-back system
Newfoundland		**Non-alcoholic** 8¢, all **Wine/Spirits** 10¢ < 500 ml 20¢ > 500 ml **Beer** 10¢ < 1 L 20¢ > 1 L	**Structured**	Half-back system
Yukon		**Non-alcoholic** 10¢ < 1 L 35¢ > 1 L **Wine/Spirits** 15¢ < 1 L 35¢ > 1 L **Beer** 10¢, refillable	**Structured**	Half-back system
UNITED STATES				
California		4¢ < 24 oz. 8¢ > 24 oz.	**Structured**	Raised in '89, '04
Hawaii		5¢	**Uniform**	
Connecticut		5¢	**Uniform**	
Delaware		5¢	**Uniform**	
Iowa		5¢	**Uniform**	
Maine		5¢, non-wine/liquor 15¢, wine/liquor	**Structured**	
Massachusetts		5¢	**Uniform**	
Michigan		10¢	**Uniform**	Highest in the United States
New York		5¢	**Uniform**	
Oregon		2¢, standard refillables 5¢, all others	**Structured**	
Vermont		5¢, non-liquor 15¢, liquor	**Structured**	

Table 4-12
Deposit Levels in Benchmarked Programs continued

Jurisdiction	Local Deposit	$CDN	Type	Comment
INTERNATIONAL				
Finland	€ 0.25, all Aluminium			
Norway	**Aluminium & PET Plastic** 1.00 NOK < 500 ml 2.50 NOK > 500 ml		**Structured**	Govt imposes a sliding scale tax based on container recovery rate
Sweden	**Aluminium** 0.50 SEK, all **Glass** 0.56 SEK, 0.90 SEK, **Plastic** 1.00 SEK, non-refillable PET < 1 L 2.00 SEK, non-refillable PET > 1 L 4.00 SEK, refillable PET		**Structured**	
Germany	€ 0.25		**Uniform**	
South Australia	5¢, at depots 10¢, at retailers		**Structured**	

4.12 HANDLING COMMISSIONS

Handling commissions are fees paid to collectors of beverage containers to compensate them for resources committed to managing beverage container collection at their place of business. Table 4-13 illustrates average handling commissions in jurisdictions across benchmarked countries.

Table 4-13
Handling Commissions in Benchmarked Programs

Jurisdiction	Handling Commission	
CANADA		
Province		**¢ / unit**
Alberta		**4.44**
Saskatchewan		4.12
British Columbia		3.74
New Brunswick		3.40
Nova Scotia		3.29
Newfoundland		3.10
Quebec		2.00
Prince Edward Island		2.00
Ontario		0.08
Manitoba		N/A
Yukon		N/A
UNITED STATES		
State	**¢ / unit**	**US¢/unit**
California	2.13	1.80
Connecticut - Beer	1.77	1.50
Connecticut - Soft Drinks	2.36	2.00
Delaware	1.18	1.00
Hawaii	1.77	1.50
Iowa	1.18	1.00
Maine - commingling arrangement.	4.13	3.50
Maine - no agreement	3.54	3.00
Massachusetts	2.66	2.25
Michigan	25% unredeemed deposits	
New York	2.36	2.00
Oregon	0.00	0.00
Vermont	3.54	3.00
SCANDINAVIA		
Country	**¢ / unit**	**€ / unit**
Sweden	4.60	0.039
	¢ / unit	**NOK/unit**
Norway	2.55	0.18

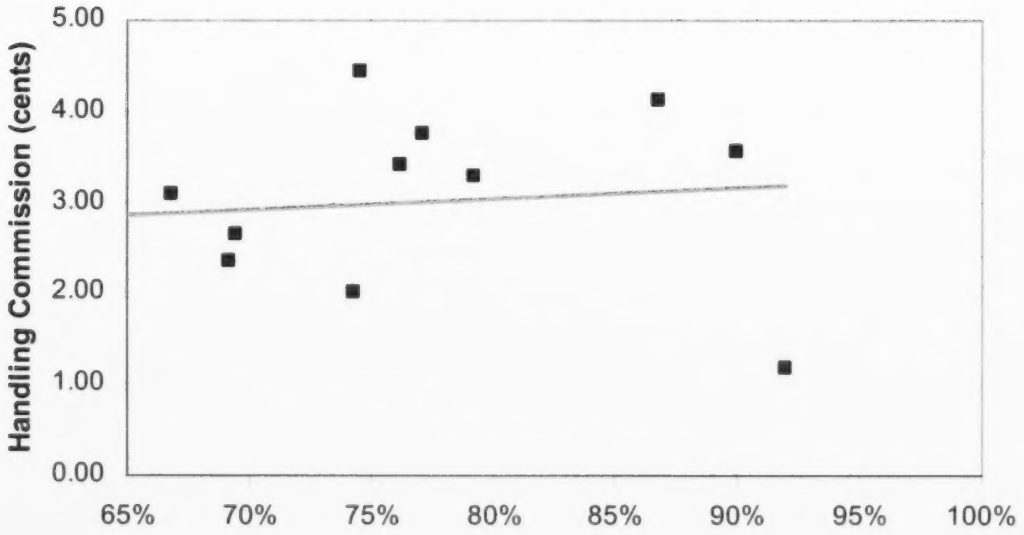
Alberta has High Handling Commissions Rates

Most American states have a uniform rate for handling commissions, with Connecticut and Maine structuring their fees to account for different collection characteristics. In Canada, Quebec, New Brunswick, and PEI employ uniform handling fees for non-beer containers. Alberta has a detailed handling commission schedule outlined in Appendix A.

Alberta employs the second highest handling commissions to fund its bottle depot network of benchmarked jurisdictions—only Sweden used higher rates. In Sweden, handling commissions consider the increased cost of capital for retailers having reverse vending machines.

Exhibit 4-10 illustrates that there is no statistical relationship between higher program recovery rates and increased handling commissions.

Exhibit 4-10
Relationship of Recovery Rates and Handling Commissions



4.13 SCANDINAVIAN PROGRAMS

4.13.1 PROGRAM DESCRIPTIONS

The programs of Sweden and Norway are of particular interest to the benchmarking study due to their relatively similar demographic profile. These two Nordic countries have relatively less population density when compared to other non-Canadian jurisdictions (Exhibit 4-11), which is thought to be an important indicator when differentiating between programs, as transportation costs system-wide will be significantly affected.

Both countries have enacted governing legislation requiring brandowners to accept responsibility for managing the recovery of non-refillable beverage containers once they have been consumed. Industry has organized itself in such a way that containers are managed by packaging material type – specifically in Producer Responsibility Organizations that manage aluminium and non-refillable PET containers.

Membership to these stewardship organizations is optional; but there is benefit to participating. In Norway, a sliding scale levy is established to reward brandowners for superior recovery. Participating brandowners may aggregate their overall recovery rates, while independents brandowners would be subject to a separate levy, which is directly tied to the actual recovery rate attained for beverage containers as shown in Exhibit 4-12.

The levy offers brandowners an incentive to pursue higher recovery rates, rather than the implicit disincentive that exists when brandowners are allowed to retain unredeemed deposits.

Exhibit 4-11
National Populations per Square Kilometre

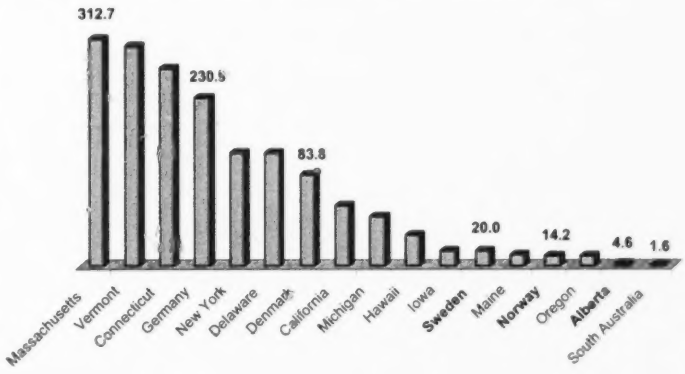
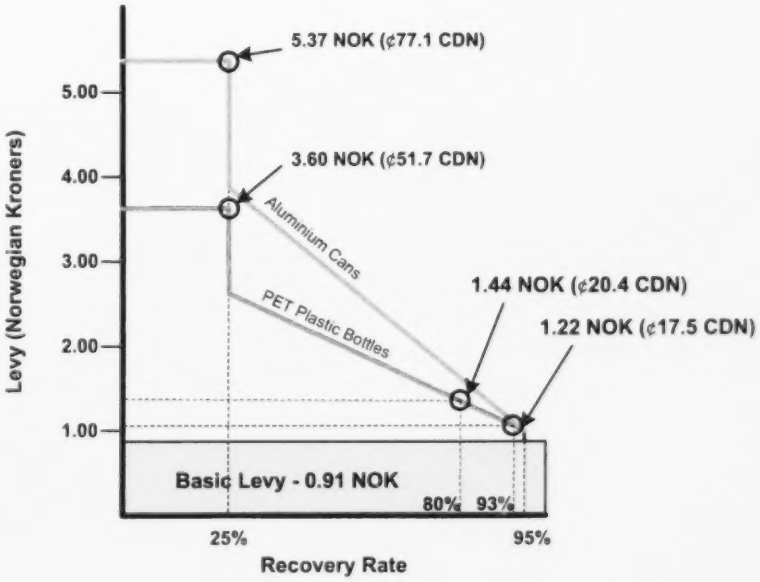


Exhibit 4-12
Norwegian Sliding Scale Levy for PET and Aluminum Beverage Containers



4.13.2 MARKET AND RECOVERY MIX

The non-refillable market in Scandinavian countries is significantly less than what is found in Alberta. Table 4-14 depicts sales per capita for non-refillable aluminium and PET plastic bottles.

Table 4-14
Non-refillable Container Sales per Capita in Alberta and Scandinavia

Jurisdiction	Aluminium (Beer & Non-beer)	PET Plastic (Non-refillable)	Combined (Aluminium & PET)
Alberta	256.3	99.3	355.6
Sweden	101.5	40.6	142.1
Norway	43.3	13.5	56.8

Refillable glass and refillable PET make up a significant percent of the market share in these jurisdictions. When considering Finland, only 3% of beer and soft drink packaging are disposable. Life cycle analysis in Finland has also shown refillable beverage containers to be significantly more environmentally friendly than aluminium cans, which have greater impacts on acidification, climate change and ozone depletion.

Norway, Sweden, and Finland have all widely deployed Reverse Vending Machine (RVM) technology to facilitate the recovery mechanism within their respective return-to-retail models. Accessibility is one of the central elements of these systems and, with thousands of return points across each country, consumers can easily find a collection point for their empty beverage containers. Approximately 80-90% of beverage containers collected in Scandinavia are redeemed through RVMs.

Adding to the recovery mix in Scandinavia is the deposit value imposed on non-refillable containers, as seen in Table 4-15. Once adjusted to consider purchasing power parity (PPP), the deposits are higher than those utilized in Alberta, and become an increasing incentive to consumers to return empty containers.

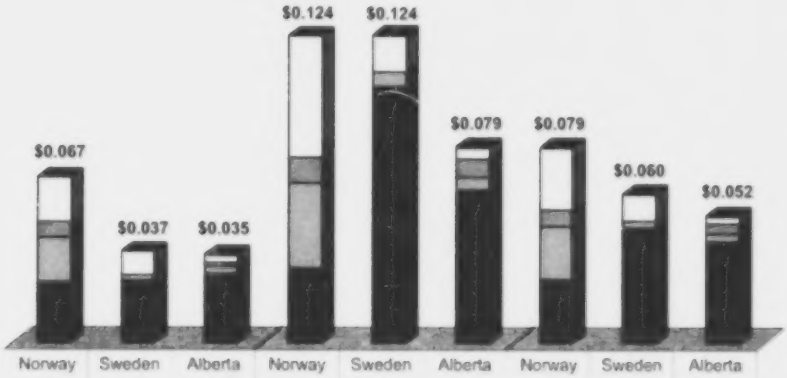
Table 4-15
Scandinavian Deposit Values

Container Size	Deposit Value (NOK)	Deposit Value ($CDN – PPP adjusted)	Container Size	Deposit Value (Euro)	Deposit Value ($CDN – PPP adjusted)
NORWAY			SWEDEN		
Up to 500 ml	1.00	$0.14	Aluminium Cans	€0.056	$0.07
Greater than 500 ml	2.50	$0.36	PET up to 1 L	€0.111	$0.13
			PET greater than 1 L	€0.222	$0.26

4.13.3 FINANCIAL BREAKDOWN OF PROGRAM

Both Norsk Resirk (Norway) and Returpak (Sweden) made financial information available to the benchmarking study. A detailed breakdown of the costs and comparison with Alberta's program is provided in Appendix E. A summarized breakdown is illustrated in Exhibit 4-13.

Exhibit 4-13
Financial Performance Comparison – Scandinavia and Alberta



	Norway	Sweden	Alberta	Norway	Sweden	Alberta	Norway	Sweden	Alberta
		Aluminium			PET Plastic			Aggregate	
Regulatory Transfers	$0.000	$0.000	$0.000	$0.000	$0.000	$0.000	$0.000	$0.000	$0.000
Administration, Advertising, System Development	$0.019	$0.010	$0.003	$0.049	$0.015	$0.005	$0.025	$0.011	$0.003
Processing	$0.006	$0.000	$0.002	$0.010	$0.000	$0.007	$0.007	$0.000	$0.004
Transportation	$0.018	$0.002	$0.002	$0.035	$0.006	$0.005	$0.022	$0.003	$0.003
Handling Commissions	$0.024	$0.025	$0.028	$0.030	$0.103	$0.062	$0.026	$0.046	$0.040

Alberta in comparison ranks well when compared to these jurisdictions—it is important to remark that both countries must account for the increased cost of capital required to implement and maintain RVMs. This is accounted for in the handling fee structure employed in Sweden (Table 4-16), which rewards retailers who employ RVM technology.

Table 4-16
Sweden's Handling Compensation Schedule

Handling Compensation	Aluminium (Beer & Non-beer)	PET Plastic ≤ 1 L (Non-refillable)	PET Plastic > 1 L (Non-refillable)
With RVM	€0.016	€0.056	€0.067
Without RVM	€0.000	€0.044	€0.044

Normalization through Purchasing Power Parity (PPP)

All financial data considered from Norway and Sweden has been adjusted to reflect the purchasing power parity (PPP) between those countries and Canada. The rationale for this methodology is to reflect real costs incurred by agents operating in those jurisdictions that are subject to substantially higher costs than those in Canada, and cannot be accurately reflected by simple exchange rate averages. Using the PPP index is a widely accepted practise when comparing jurisdictions in international context and is published annually by the World Bank and the Penn World Table. The table used by this study is detailed in Appendix F.

4.14 ONTARIO ANALYSIS

4.14.1 ALCOHOLIC BEVERAGES

Beverage containers in Ontario are handled in two streams:

1. Beer and alcoholic beverages
2. Non-alcoholic beverages

The recovery mechanism differs for each stream—the beer and alcoholic beverage stream utilizes a deposit regime so that brandowners can take advantage of consistently elevated recovery rates. In the province of Ontario, sales of alcoholic beverages occur at licensed premises. Consumers are able to return empty containers to retailers including The Beer Store and Liquor Control Board of Ontario outlets. These two agents act collaboratively to achieve greater recovery and efficiencies throughout the system

Alcoholic beverage brandowners are also subject to the Waste Diversion Act (Bill 90) and must meet certain reporting requirements with regard to recovery of packaging materials distributed by retailers. This report includes all primary and secondary packaging sold within the system—which includes not only beverage containers, but also corrugated cardboard, metal crowns, and plastic.

Table 4-17 describes recovery rates reported by the Beer Store in the fiscal year 2004.

Table 4-17
The Beer Store Materials Recovery – Fiscal 2004

Container Type	Sales (The Beer Store)	Sales (LCBO)	Returns	Recovery
Primary Packaging (units sold)				
Refillable (Glass) Bottles	1,397,037,293	163,663,189	1,501,342,686	96%
Non-refillable Glass Bottles	108,216,333	133,602,910	144,197,244	50%
Aluminium Cans	151,637,560	78,389,606	144,197,244	63%
Steel Cans	412,937	400,055	98,268	12%
Draught Kegs	1,484,359	-	1,481,271	99.8%
PET Bottles	160,682	213,891	116,039	31%
Secondary Packaging (tonnes sold)				
Corrugated / Boxboard	28,110	2,508	26,311	86%
Metal (Crowns)	3,011	595	150	4%
Plastic	268	50	77	24%

4.14.2 NON-ALCOHOLIC BEVERAGES

4.14.2.1 Program Description

Waste Diversion Ontario is the Delegated Administrative Organization responsible to oversee the responsible environmental management of several designated materials that impact the waste stream in Ontario. This multi-materials stewardship board is specifically mandated to oversee the operation of the province's scrap tire, used oil, waste electronics, and blue box programs.

Non-alcoholic beverage containers within the system are recovered through the province-wide blue-box system that incorporates a combination of municipal curbside collection and drop-off programs (drop-off programs are usually used in rural communities). Collection systems are operated by municipalities or their delegated agents and are required to collect five basic materials, including Old Newsprint (ONP), Glass, Aluminium Cans, Steel Cans, and PET plastics. An additional twelve product categories are optional to include within the program. Table 4-18 summarizes community program information for 2004.

Table 4-18
Summary of Optional Materials Included within Ontario's Blue Box Programs

Material	Category Includes Beverage Containers	No. of Programs	% of Programs Served	Households Served	% of Households Served
Basic Materials	Yes	190	100%	4,632,051	100%
Corrugated Containers		140	74%	4,482,428	97%
Boxboard Cartons		134	71%	4,469,208	96%
Gable Top Containers	Yes	57	30%	3,337,948	72%
Aseptic Cartons	Yes	59	31%	3,333,471	72%
Aluminium Foil		108	57%	3,907,431	84%
Empty Aerosol Cans		67	35%	2,641,133	57%
Empty Paint Cans		65	34%	2,995,914	65%
HDPE Containers	Yes	138	73%	4,505,777	97%
Other Bottles	Yes	78	41%	2,443,052	53%
LDPE / HDPE Film		66	35%	2,412,043	52%
Tubs / Lids		87	46%	2,652,946	57%
Polystyrene Containers	Yes	49	26%	1,563,398	34%
ALL BEVERAGE CONTAINER MATERIALS	Yes	26	14%	1,193,717	26%

In 2004, only 26% of Ontario households had access to a complete complement of beverage recycling options.

4.14.2.2 Program Funding

Programs are funded by product brandowners and by communities. Brandowners are responsible to fund 50% of the total net costs incurred by municipalities, less 10% for effectiveness and efficiency development, and a further $1.3 million of in-kind advertising provided by the Canadian Newsprint Association (CNA) and the Ontario Community Newspaper Association (OCNA). Net costs are calculated as the total gross revenues incurred by community programs minus gross revenues gained by communities (three year rolling average).

Funding is submitted to WDO by brandowners through Stewardship Ontario, the Industry Funding Organization delegated to act on behalf of the brandowners. Brandowners submit to Stewardship Ontario stewardship fees according to an agreed upon Schedule of Stewardship Fees (Table 4-19).

Table 4-19
Stewardship Ontario's Fee schedule 2003 - 2005

Material	2003 Fee Rate (¢ / kg)	2004 Fee Rate (¢ / kg)	2005 Fee Rate (¢ / kg)
PRINTED PAPER			
Newsprint	0.028	0.026	0.271
Newsprint – Non CAN/OCNA	0.028	0.026	0.786
Magazines and Catalogues	0.081	0.310	0.862
Telephone Books	0.081	0.687	1.302
Other Printed Paper	0.251	1.318	9.029
PACKAGING			
Paper-based Packaging	4.728	5.987	7.904
Plastics Packaging	6.692	9.610	13.907
Steel Packaging	3.633	4.391	4.745
Aluminium Cans	-5.465	-3.193	-1.093
Foil & Other Aluminium	-5.465	-3.193	5.502
Clear Glass Packaging	3.723	3.682	3.761
Coloured Glass Packaging	4.016	3.916	4.432

According to SARCAN's (Saskatchewan) audited container weight rates steward fees by container are presented in Table 4-20. The negative values for aluminium containers are credited to brandowners to a maximum of nil, where brandowners who market other container types would have their stewardship fee reduced, but would not receive funds in return.

Table 4-20
Stewardship Fees per Beverage Container

Material	Grams / Container	2004 Fee (¢)	2005 Fee (¢)
Aluminium Can	72.1	-0.230	-0.079
PET (< 1 L)	142.2	1.366	1.977
PET (≥ 1 L)	276.3	2.655	3.843
Glass (< 1 L)	2,062.3	7.789	8.333
Tetra Pak	112.4	0.673	0.888
Polycoat	202.1	0.887	0.959
Tin (< 1 L)	300.8	1.321	1.427

Funding received by communities is calculated as a function of total weight and volumes processed, and is further equalized according to multiple demographic indicators. The funding is distributed 40% by weight and 60% by volume, with an equalization factor utilized to appropriately scale allocations according to census data. Smaller programs receive relatively higher funding. Also considered is a minimum and maximum cap for funding, which is determined relative to actual costs. Minimum funding is 15-20% of net program cost, when maximum capping is 55-60% of the same indicator. Considering this system, a municipal program can increase its funding if it either amalgamate with a less dense region and offers a regionalized service, or if it increases the tonnage it collects.

In 2004, $29.5 million was paid to communities through stewardship funding, which represented 29.9% of the reported 2002 net cost. Allocations budgeted for 2005, according to reported 2003 net costs, are pegged at $51.3 million (43.9 % of 2003 net cost), which more accurately reflects the targeted cost-sharing equation.

4.14.2.3 Program Performance

53 % Recovery for All Materials – Estimated 41% for Beverage Container Packaging

The Ontario Blue Box Program is continuing to expand and offering additional recycling options to consumers in the province. Communities are adding optional materials to their programs, and rural communities are implementing community curbside collection programs rather than drop-off programs. In all, 823,635 tonnes was reported as collected and recycled through the program in 2004. The advantage of the provincial program is that it considers a larger component of the consumer recyclables spectrum and extends into other packaging materials and paper materials.

Recovery rates, reported in Stewardship Ontario's 2004 Annual Report, by material are seen in Table 4-21.

Table 4-21
Blue Box Program Recovery Rates

Material	Generated (Tonnes)	Recovered (Tonnes)	Recovery Rate
PRINTED PAPER			
Newspaper & Magazines	496,300	396,898	74.5%
Other Printed Paper	142,800	60,717	42.5%
PAPER SUBTOTAL	639,100	430,614	67.4%
PACKAGING			
Paper Packaging	328,100	156,902	47.8%
Plastics	219,000	35,382	16.2%
Steel	66,900	32,583	48.75
Aluminium	26,508	10,113	38.2%
Glass	194,700	114,249	58.7%
PACKAGING SUBTOTAL	835,208	349,230	41.8%
TOTAL	1,474,308	779,844	52.9%

Normalization of this data led to estimates of beverage container recovery rates, presuming that recovery rates were consistent across beverage container packaging and other packaging materials alike. For the purposes of this study and the availability of information, this is considered to be the most representative estimate possible. Overall, beverage containers are estimated to be recycled at a rate of 41%.

$110.8 million is the Ontario 2004 Net Blue Box Program Cost

In 2004, communities reported $110.8 million in net costs (after revenue), which according to WDO's stewardship fee calculation equates to a share of roughly $48.5 million. Due to the delay in recovering and analyzing data through the provincial datacall survey, this funding will be allocated to municipalities through the 2006 reporting period. In terms of financial performance the average gross cost and revenues per tonne, as reported by WDO, are broken down in Table 4-22.

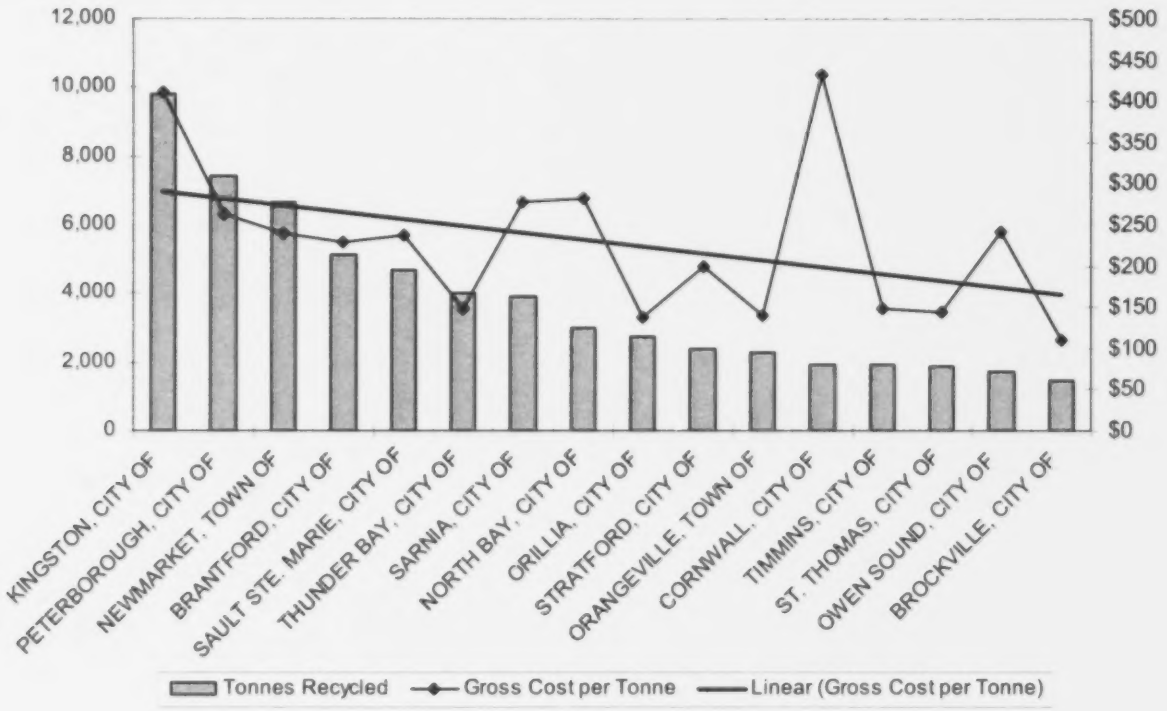
Table 4-22
Average Blue Box Program Costs

Material	Average Cost per Tonne
Residential Collection Costs	$153.27
Residential Processing Costs	$69.25
Residential Depot/Transfer Costs	$12.58
Promotion & Education Costs	$4.83
Stockpiling Costs	$0.04
Administration and Interest on Municipal Capital	$9.14
Gross Cost per Tonne	$236.13
Gross Revenue per Tonne	($101.69)
Net Cost per Tonne	$134.44

Costs Increase with Tonnage

Exhibit 4-14 shows the linear relationship between tonnage collected and gross cost per tonne for small urban Ontario communities (populations from 20,000-115,000).

Exhibit 4-14
Relationship between Overall Tonnage Recycled and Gross Tonnage Costs in Ontarian Small Urban Communities



Economies of scale do not result with increased recycling tonnage. Rather, as greater volumes are collected, costs increase. It is reasonable to interpret that larger centres require additional recycling alternatives, with the programs in Kingston and Peterborough including almost all optional materials whereas St. Thomas and Brockville only include a few optional materials within their Blue Box programs.

Ontario Recycles More Overall

When collection volumes are compared between similar Ontarian and Albertan communities, small urban Ontarian communities collected on average 67.62 kg per capita, where Albertan communities collected 56.77 kg per capita (including beverage containers—14.62 kg per capita). In Alberta, with a few exceptions including Edmonton and Red Deer, most communities have established drop-off programs (Calgary is evaluating a blue box trial program within the city).

This data is illustrated in Table 4-23.

Table 4-23
Per Capital Recycling Comparison between Alberta and Ontario Communities

Community	Population	Recovered Per Capita (Kilograms)	Recovered Per Capita (w/ Beverage Containers)	Gross Cost per Tonne	Gross Cost (w/ Beverage Containers)
ONTARIO					
Kingston	114,195	86.08	N/A	$411	$411
Peterborough	71,446	103.56	N/A	$262	$262
Newmarket	65,788	100.90	N/A	$240	$240
Brantford	86,417	59.47	N/A	$229	$229
Sault Ste. Marie	74,566	62.57	N/A	$236	$236
Thunder Bay	109,016	36.89	N/A	$149	$149
Sarnia	70,876	55.07	N/A	$278	$278
North Bay	52,771	57.12	N/A	$281	$281
Orillia	32,692	83.53	N/A	$137	$137
Stratford	31,129	76.58	N/A	$200	$200
Orangeville	27,576	82.10	N/A	$141	$141
Cornwall	45,640	42.83	N/A	$432	$432
Timmins	43,686	44.54	N/A	$147	$147
St. Thomas	33,236	56.59	N/A	$144	$144
Owen Sound	21,431	80.14	N/A	$241	$241
Brockville	21,375	70.08	N/A	$111	$111
ALBERTA					
Edmonton	712,391	56.34	70.96	N/A	N/A
Calgary	956,078	30.33	44.95	N/A	N/A
Red Deer	79,082	40.77	55.39	$453	$468
Lethbridge	77,202	32.54	47.16	$279	$294
Medicine Hat	56,048	82.07	96.69	N/A	N/A
Grande Prairie	44,631	37.66	52.28	N/A	N/A

4.15 CALIFORNIA ANALYSIS

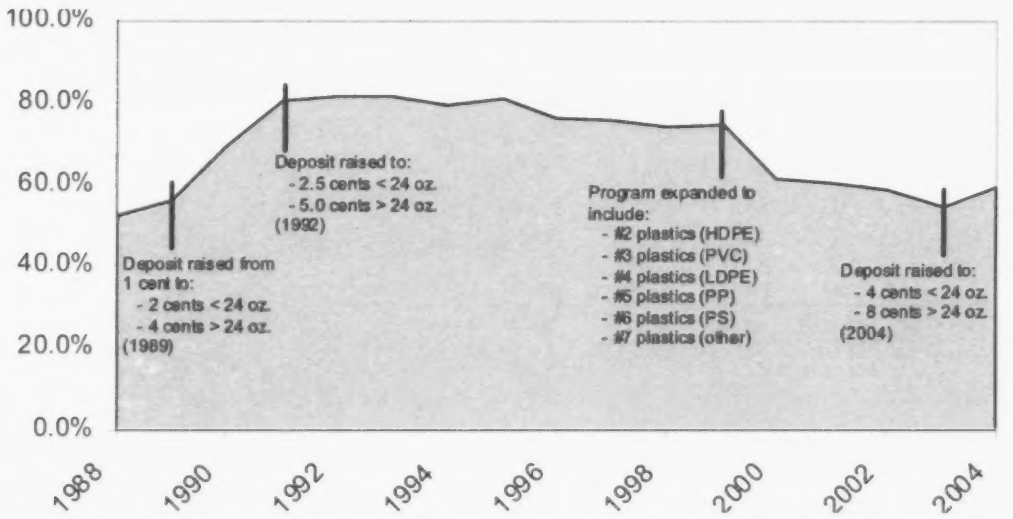
The Department of Recycling is a branch within the Department of Conservation and has been specifically established to oversee the governance of the deposit regime in California. The program is responsible for participant certification and registration, regulatory compliance, grant funding distribution, as well as technical and educational assistance to other industries and groups involved in beverage container recycling. An 80% recovery of aluminium, glass, plastic, and bi-metal containers sold in the state is the target objective of the program.

Containers included within the program, like many other U.S. states, are specifically included by legislation, whereas applicable containers in Alberta must be made specifically exempt by legislation. This differentiation is important as new container materials must be added to the program, which may consume costly legislative resources, whereas Albertan containers are included by default, until specifically exempt. Applicable containers in California are limited to:

Carbonated mineral and soda water and other similar carbonated soft drinks, non-carbonated soft drinks, wine coolers and distilled spirit coolers, beer and malt beverages, non-carbonated water including non-carbonated mineral water, sport drinks, coffee and tea drinks, vegetable juice in containers 16 ounces or less, carbonated and non-carbonated fruit drinks that contain any percentage of fruit juice and 100 percent fruit juices that are packaged in containers less than 46 ounces.

Polycoat containers are not included under the program. Exhibit 4-15 illustrates California's historical recovery rates since its inception.

Exhibit 4-15
California's Overall Recovery Rates Through 2004



Since being implemented in 1987, the program has undergone many noteworthy alterations that contributed to overall recovery rates attained within the program:

- **1989**—Deposits were increased and structured to reflect different values for containers greater or less than 24 ounces. The deposit inflation led to three years of significant growth in the program, increasing recycling rates for all materials from 56% to 80%.

- **1992**—Deposits were again adjusted to match inflation of the economy. The increase had no significant effect on recovery rates that stabilized at approximately 80%. A slow downward trend and softening of recovery rates can be seen following this adjustment.

- **2000**—The program was expanded to include all plastics sold under the program, including plastics #2 - #7. Consequently, the impact of having non-traditional plastics in the program (only #1 PET was previously included) lowered recovery performance. Traditional materials also saw reduced recovery rates over this period.

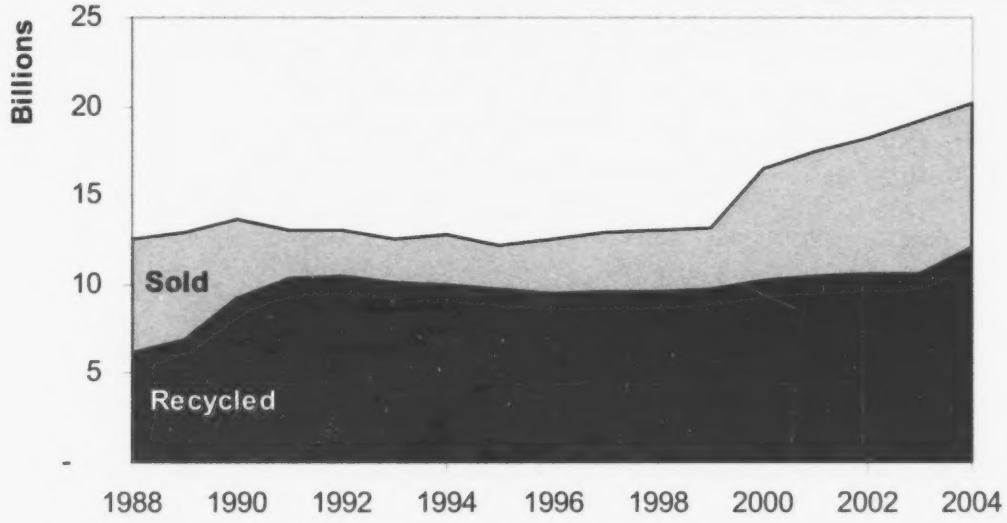
- **2004**—Deposits were adjusted in 2004 to curb the downward trend observed by recovery rate performance. This increase was supported by a U.C. Berkeley Study completed in 2002 that concluded that if deposits were doubled, forecasted recovery rates for aluminium, glass, and #1 PET would reach 90%, 81%, and 61% respectively. The overall rate was forecasted to reach 82%. Deposits were raised to 4 and 8 cents for containers less than and greater to 24 ounces, rather than the 5 and 10 cent level proposed by the study, and achieved a 14% increase over the previous year's recovery rate.

Californian Advantage

The California program has the added advantage of being able to attain significant economies of scale due to the large, dense population demographic. In 2004, over 20.2 billion applicable containers were sold in the state (12.0 billion were collected). By contrast, Alberta sold and recovered 1.7 and 1.3 billion containers in 2004.

Exhibit 4-16 demonstrates the magnitude of the Californian program.

Exhibit 4-16
California Sales and Recycling Volumes through 2004



The added density component has allowed the program to setup a recovery model which combines a mix of redemption depots and return-to-retail. Consumers may also use drop-off and curbside collection options to recycle their containers, thereby forfeiting their deposit refund.

Funds not directly used in the environmental management of beverage containers are escheated and used to fund other environmental programs.

4.16 KEY QUESTIONS

4.16.1 QUESTION ONE—PROGRAM EFFECTIVENESS

How does the overall effectiveness of Alberta's programs in terms of achieving mandated outcomes (material collection rates, etc) compare with programs targeting those same materials in other jurisdictions?

Scope of Containers is Wide Reaching

The breadth of the designated containers being managed in Alberta is as wide reaching as any program in the world, with the exception of those programs that include flavoured milk containers within the scope of their programs.

Alberta is Comparable Among World Leaders

Alberta currently recovers 80.28% of the beverage containers sold in the province. Alberta maintains a comparable recovery rate among the world's leading beverage container recycling programs, although not an outright leader in the domain. Opportunity exists to increase recovery rates for traditional and non-traditional containers alike.

Recovery is Missing Targets

The Beverage Container Management Board's goal of 85% total recovery in the province should be within the threshold of reasonably attainable recovery rates when benchmarked against other jurisdictions. To this end, little tangible progress has been made in realising this goal in recent years. Overall, while handling annual incremental growth, the recovery rate for all beverage containers since the inclusion of domestic beer in 2001 has increased 0.8%, with zero growth in the recovery of aluminium and plastic containers over the same period of time.

Detailed analysis shows that Albertan recovery rates by container stream are comparable to those in similar jurisdictions, and are far superior to those in non-deposit regimes. However the BCMB's mission to be a leader in the domain has not been achieved, with none of the eight container types meeting speculative target return rates:

- **Aluminium**—Alberta ranks average in absolute standing among programs reporting aluminium recovery, but maintains comparable returns to those programs. The program fell short of its target of 85% by 4.4%.
- **Plastics**—Plastics is an area of concern, as it missed the program target by a 6% margin, and of the 14 programs reporting statistics, it only had greater returns than 3 deposit jurisdictions and the 2 curbside programs studied.
- **Glass**—Non-beer glass missed performance objectives by 2.2%, and when considered with imported beer, recycling rates are above average for non-refillable glass containers.
- **Polycoat**—Inclusion of non-traditional drinks in the program has proven challenging; yet polycoat container recovery rates have increased 18.4% since their inception into the program, and 6.8% in the last four years. Sustained efforts are needed to continue to achieve continued improvement in this area. The target for polycoats (58%) was missed by 1 percent.
- **Bi-Metal**—Bi-metal containers, also being a non-traditional container in the system has suffered poor recoveries, failing to meet the 63% objective by 7.3%.

- **Beer Cans**—Aluminium beer can returns were a strength of the Albertan program in 2004, ranking second among Canadian programs. It however narrowly missed its recovery target of 92%.

- **Beer Bottles (Domestic)**—A strong performer, domestic beer containers Canada-wide achieve considerable success in recovery rates, with all recovery rates falling between 93-99%. At 96.3%, beer bottles were the highest achiever provincially, missing its target by 0.7%.

4.16.2 QUESTION TWO—FINANCIAL COSTS

How are the financial costs attributable to achieving mandated outcomes of Alberta's programs and how does this compare (on a cost-effectiveness basis) with the programs in other jurisdictions?

Excellent Operational Performance, High Handling Commissions, Comparable Program Cost

The cost to run Alberta's beverage container recycling program is competitive with comparable jurisdictions, and has achieved superior performance in the domain of operational cost making it a market leader. However the economies gained through operations are lost due to the highest handling commissions paid compared to benchmarked programs across North American. Only Sweden was found to have paid out higher handling commissions and it is intended to cover costs including capital depreciation for infrastructure (i.e. RVMs).

Exhibit 4-17 illustrates program costs in relation to recovery rates for jurisdictions reporting financial data.

Exhibit 4-17
Program Costs as a Function of Recovery for Benchmarked Programs

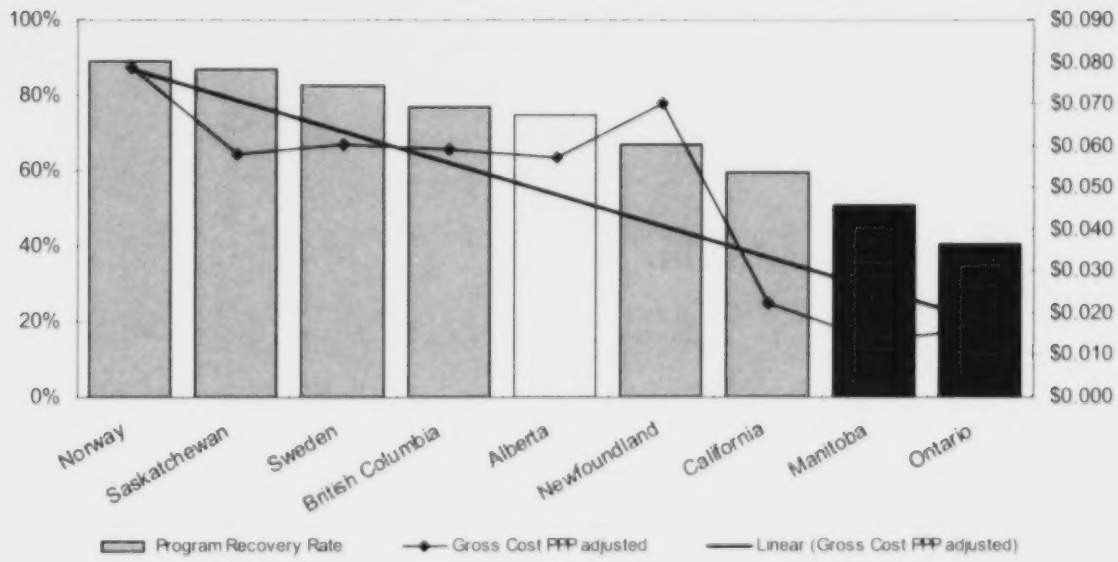


Table 4-24 details the figures used in Exhibit 4-17. It considers only those costs incurred within the stated program (i.e. ABCRC only reports financials for the province's non-beer recycling).

Table 4-24
Program Recovery and Cost Data

Jurisdiction	Program Recovery Rate	Gross Cost per Container	Gross Cost PPP adjusted
Norway (Norsk Resirk)	89.0%	$0.100	$0.079 *
Saskatchewan (SARCAN)	86.8%	$0.058	$0.058
Sweden (Returpak)	82.6%	$0.071	$0.060 *
British Columbia (Encorp)	77.1%	$0.059	$0.059
Alberta (ABCRC)	74.6%	$0.058	$0.058
Newfoundland (MMSB)	66.8%	$0.070	$0.070
California (DOR)	59.6%	$0.022	$0.022
Manitoba (MMSB)	50.7%	$0.014	$0.014
Ontario (WDO)	40.6%	$0.016	$0.016

* Programs adjusted for PPP

Scandinavian Not-for-Profit Organizations Not Profiting

The net system performance for non-refillable container recycling generated roughly $11.8 million in excess of revenues for 2004. The ABCRC alone generated $10.0 million in excess of revenues over expenses, as a not-for-profit stewardship corporation. Comparable programs in Norway and Sweden are operated with surpluses running much closer to nil. Table 4-25 shows net revenues in programs as a function of gross revenues, illustrating the relative magnitude of the surplus.

Table 4-25
Program Revenues—Net of Gross

Jurisdiction	Excess of Revenue ($CDN)	% of Revenue
Alberta (ABCRC)	**$ 10,010,600**	9.1%
British Columbia (Encorp Pacific Inc.)	**$ 5,586,154**	4.7%
Norway (Norsk Resirk)	**$ 401,004**	0.7%
Sweden (AB Returpak)	**$ 2,386,936**	1.5%
Newfoundland (MMSB)	**$ 2,134,394**	12.3%
California (DOR)	**$ 223,275,850**	18.4%

Subsequently container recycling fees in Alberta 2005 have been adjusted to meet updated forecasts, with aluminium cans no longer charging any fees.

Industry Lacking Transparency

Transparency is lacking on the part of many brandowners, particularly those who manage the collection of domestic beer containers in Canada, and virtually all brandowners in the United States. This includes the Alberta Beer Container Corporation. Reporting is fulfilled, often meeting minimum requirements to protect information considered proprietary. Although the non-beer program has been largely successful in making information publicly available and thus accurately reflecting their environmental responsibility, significant potential for growth exists in the beer recycling stream. To this end, only limited financial information has been made available, whereas a thorough examination of program costs and recovery is not possible at this time.

4.16.3 QUESTION THREE—DISPOSITION OF RECYCLED MATERIALS

How do the Alberta programs compare with programs in other jurisdictions in terms of the disposition of collected materials (i.e. volumes and/or rates of collected materials that are re-used and recycled)?

Beverage Container Recycling is a Closed Loop

Beverage container recycling in Alberta, as in other programs, is a closed-loop system. Effectively all materials recovered are in turn recycled or reused, with no real leakage into the waste stream. To this end, Alberta is as effective as any jurisdiction worldwide when it comes to environmentally managing the disposition of designated materials under the beverage container management program. Table 4-26 describes how collected materials are recycled in Alberta.

Table 4-26
Beverage Container Materials disposition in Alberta

Material	End-Use
Aluminium	• Aluminium cans are collected and baled into compact blocks that are transported to a smelter in the United States. The aluminium is then resold as a raw material that is generally used to make new aluminium **cans**.
Polyethylene Tetraphalate Plastic (PET)	• PET plastic is baled and transported to reprocessing facilities where it can be used to make **new plastic bottles** and **plastic film** to be used in other packaging.
High Density Polyethylene Plastic (HDPE)	• HDPE plastic is baled and transported to reprocessing facilities where the material is used in the manufacturing of **non-food containers, plastic film, fleece materials and carpet**.
Glass	• Glass is shattered and collected to be sold to manufacturers of **fibreglass**, **new glass containers**, or to be used in **reflective highway paint**.
Aseptic Drink Packages	• Aseptic packaging is baled and sold to be used in **manufactured paper**

Material	End-Use
	products, including filler plys for medium and grey gypsum wallboard cover. Residual plastic and aluminium (~35%) are used for **energy recovery**.
Gable Top Containers	• Aseptic packaging is baled and sold to be used in **manufactured paper products**, including filler plys for medium and grey gypsum wallboard cover.
Bi-Metal Cans	• Bi-metal cans are baled and sold to be re-manufactured into **new metal products**.
Industry Standard Bottles	• Industry Standard Bottles, known for their durability, are used by domestic beer brandowners and can be sold, collected, cleaned, **refilled, and resold** up to twenty occasions before they are **recycled**.

4.16.4 QUESTION FOUR—APPROPRIATE AND EFFECTIVE MECHANISMS IN ALBERTA

Are the most appropriate and efficient mechanisms being employed to achieve program objectives in Alberta?

Expandability of Current Scope

Alberta's beverage container deposit program touches virtually all ready-to-serve containers sold into the provincial market place. In terms of scope, the program has three potential alternatives in selecting a path-forward:

1. **Broaden the scope to include further products**—The consumer-incentive model of deposit regimes has clearly exhibited substantially higher recovery rates. Eliminating the exemption for milk beverages, and expanding the scope to include deposits on non-beverage container packaging are potential strategies to increase overall waste diversion and drive potential economies within the system.

2. **Reduce the scope and focus on traditional beverages**—Of the 22 North American programs studied only 10 included non-traditional beverage containers within their deposit regime (Manitoba and Ontario include them as optional materials). An alternative available to the program is to eliminate non-traditional packaging from the current scope and adjoin them to municipal collection programs, while maintaining the deposit program for traditional beverage containers. This hybrid approach is the prospective model to be deployed in Quebec in the near future.

3. **Continue with the current scope**—Current performance of the program is not poor, and with non-tradition beverage containers being included only since 1998, further growth can be expected with program maturation. As consumers become increasingly aware of the deposit incentive, and adjust their behaviours accordingly, the program should expect to attain greater recovery rates.

At this point in time, discounting the current strategy with respect to program scope would be premature given the recent addition of non-traditional packaging to the product mix. The current scope is sufficient and effective in obtaining the vision of minimizing beverage containers in the waste and litter streams. The program should be able to effectively incorporate milk containers into the program, potentially leading to additional economies of scale in non-traditional beverage container recycling, if it were not for their exemption as a matter of public policy.

Modernizing the Recovery Mix

Given Alberta has a long standing deposit system in place, and consumer recycling behaviours have been established, it would be difficult to diverge from the current depot return mechanism. The likelihood that developing a return-to-retail model will achieve greater returns is poor. However, given that high labour and handling components are driving system costs, efficiencies may be realized through innovation and technological advancement alike.

- Including reverse vending machines (RVM) to the recovery mechanism mix in Alberta could generate greater accessibility and reduced front-end counting and sorting for certain containers. In the state of Massachusetts, all major supermarkets offer RVMs in addition to state certified redemption depots. In Scandinavia, upwards of 90% of all returned containers are done so through RVMs.

- Technologically advanced processing facilities have the potential to reduce both counting and sorting at depots (front-end) and processing facilities (back-end). The advantage to reduced front-end activities is obvious in reduced depot labour requirements, as well as back-end in increased auditability while again reducing labour requirements.

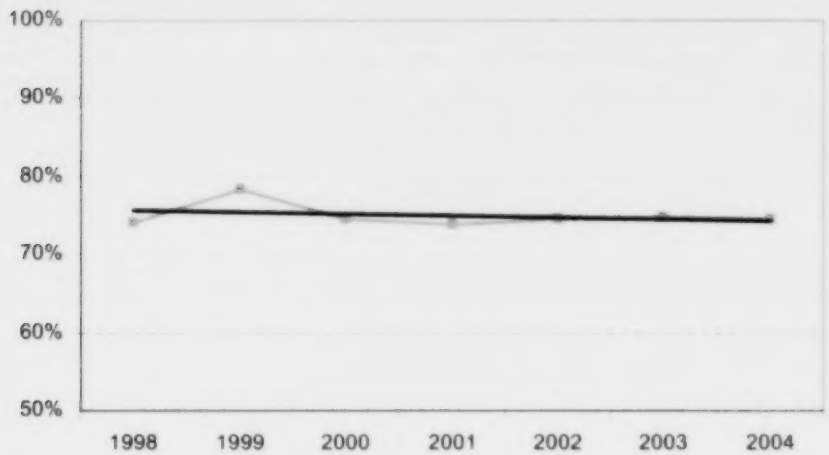
Either option would require significant capital investment, and therefore merits additional study before being qualified as a viable option within the provincial system. Should the demand within the provincial labour markets continue to strengthen at the current trend, it is not foreseeable that efficiencies will be realized without reducing the labour component.

The existence of two collection agents in the province is problematic, in that there is a clear duplication of efforts occurring in the transportation and processing of aluminium cans. With the exemption on domestic beer being abolished in 2001, there has been little or no collaboration between the two agents, inhibiting the realization of any efficiencies or system economies. Also to be considered is the existence of a third beverage container recycling stream—milk containers. All three agents recycle beverage containers and commonalities may be lead to potential synergies system-wide.

Surpassing the Plateau

Exhibit 4-18 illustrates the plateau achieved by the non-beer recycling program over the last seven years.

Exhibit 4-18
Alberta Non-beer Program Performance through 2004



Fluctuating around the 75% (~80% when beer is considered), the ceiling will need to be pierced if the province wishes to one day establish itself as a leader in beverage container recycling. The recovery threshold Alberta has reached could potentially be surpassed in an effort to realize continuous improvement through one, or a permutation, of the following alternatives:

1. **Increase container deposits**—Three jurisdictions, Saskatchewan, California and Michigan attribute the success of their programs to the higher refund value offered, as it provides increased incentive to return empty beverage containers. Furthermore, deposits in European jurisdictions are significantly higher than those found in Alberta. California has raised its deposit levels on three occasions since 1989, each leading to an increase in recovery rates.

2. **Increased promotional spending**—Of the five programs which spent more on system development and marketing per container than Alberta, three (Norway, Sweden, B.C.) had higher recovery rates, with the other two investing significantly in program infrastructure and development (Newfoundland, California). Norsk Resirk of Norway, collection agent for the deposit regime for one-way aluminium and PET plastic containers in that country, invested significantly in a promotional campaign that features a singer/songwriter spokesperson.

Recovery Not Demonstrating Improvement through Multi-Materials Boards.

The Beverage Container Management Board as a Delegated Administrative Authority is one of a few organizations mandated to oversee the entirety of the beverage container recycling program without also being accountable to manage other environmental programs. Multi-Material Boards are the norm in many provinces. The collaboration to form one governing body may have many reasons, including increased economic efficiencies and synergies in achieving common goals. However, conflicting priorities within these organizations may be detrimental to beverage container recovery rates as Table 4-27 illustrates.

Table 4-27
Recovery Rate by Multi-Material Board

Jurisdiction	Program Recovery Rate	Multi-Material Board
Saskatchewan	89.1%	No
Norway	89.0%	No
Sweden	82.6%	No
New Brunswick	82.2%	No
British Columbia	81.7%	No
Alberta	80.3%	No
Nova Scotia	79.3%	Yes
Newfoundland	77.3%	Yes
Quebec	74.1%	Yes
Manitoba	63.1%	Yes
Ontario	55.4%	Yes

This is evidence that organizations focusing efforts on accomplishing specific objectives achieve better results, all other variables aside. There exists an opportunity to champion multi-material board performance, as potential synergies to leverage common goals and overhead expenditures are recognized.

Stewardship

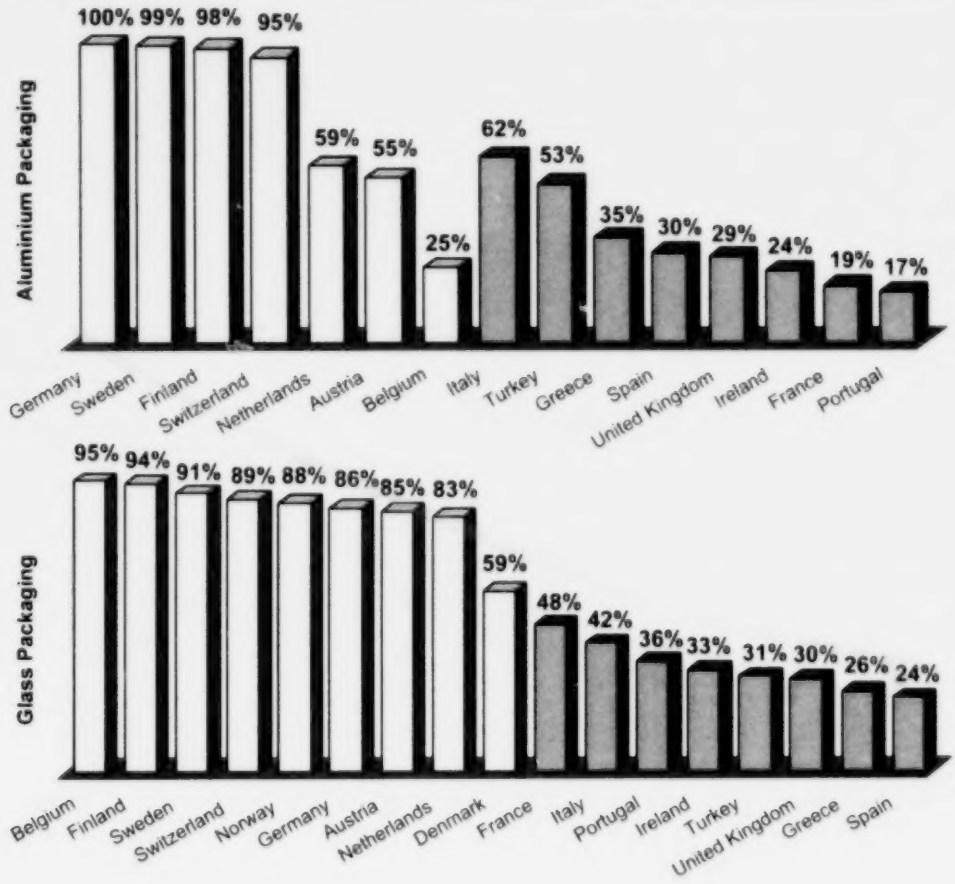
The debate over extended producer responsibility, or product stewardship in Alberta continues. The stewardship model presumes that brandowners should be held accountable for the end-use of products they produce post-consumption.

In Alberta, brandowners have been engaged to assume recycling operations throughout the province. Still, are brandowners responsible for ensuring that beverage containers do not find there way into the waste stream? In the current deposit regime there is the inherent disincentive to not recycle as unredeemed deposits fund a significant portion of the program. In actuality the consumer bears the responsibility to recycle in the consumer-incentive model—the producer provides a medium to allow consumers to achieve this, and in the absence of governing legislation, producers would continue to operate in the best interest of their shareholders, who principally desire profit maximization, not producer responsibility.

Deposits Condition Recycling Behaviour

Jurisdictions having implemented beverage container deposit regimes in Europe have exhibited, on average, higher recycling rates of like materials. Exhibit 4-19 illustrates the difference in aluminium and glass packaging recycling between European states having deposit regimes (beige) and those who do not (brown). This goes above and beyond the packaging materials managed within the scope of beverage container recycling. It is believed that conditioning behaviour through deposit incentive compels habitual mannerisms within the general public and, given a reasonably accessible alternative to material disposal, consumers have demonstrated a willingness to recycle. Therefore beverage container recycling should be recognized as a micro component in a macro program (waste management), with the ultimate goal of promoting a recycling culture.

Exhibit 4-19
European Recovery Rates for Aluminum and Glass Packaging in Deposit and Non-Deposit Regimes



4.16.5 QUESTION FIVE—LEADING PRACTICES

Are there examples of best practices or innovative approach to waste stewardship that can be identified from this analysis that would be appropriate for consideration in Alberta?

Some jurisdictions are considered programs of interest and highlighted below. They are discussed at length in the study.

- Saskatchewan's beverage container recycling program is comparable to Alberta. The main difference is that Saskatchewan has higher deposit rates and generates higher recovery rates. Saskatchewan's recovery rate is 89% versus Alberta's 80% while overall costs are indifferent—Saskatchewan's per unit cost is $0.058 versus Alberta's $0.058.

- California's program is smaller in scope but still comparable. California also experienced a plateaued program (despite the addition of items to the program scope) throughout the 1990s that saw recovery rates start to decline from 80% to less than 60%. They increased their deposit rates in 2004 and have since realized increased recovery rates.

- Finland, Norway and Sweden have comparable programs and demographics (low population density) to Alberta, and face similar collection and transportation challenges. These countries encourage refillable bottles versus disposal containers, have higher deposit fees (when normalized), employ a sliding scale levy in Norway rewarding manufacturers for superior recovery, and have widely employed technology solutions (reverse vending machines) to optimize recovery rates while lowering operating costs.

5 SCRAP TIRES

5 SCRAP TIRES

Motor vehicles are an integral component of key societal sectors including, industrial, commercial, residential and leisure applications. Rubberized tires are extremely effective given the characteristics required to transfer motor vehicle energy to the road surface and maintaining effective road-contact under various conditions. Because of the widespread use of these tires, the use of rubberized motor vehicle tires on roads and highways expands in direct relation to the increasing number of vehicle kilometres driven in a growing economy. Tire treads are inevitably subject to wear and have predictably limited life spans. Effectively managing scrap tires at the end of their useful lifetime becomes an environmental priority given the potential risk of environmental and health hazards.

Scrap tires as a component of the waste stream are typically benign and individually have little environmental impact other than the space required to manage them and the resources wasted by not recycling the materials. When stored in volume, the potential risk becomes much more significant with tire fires being of primary concern. Given the ability of administrative organizations to regulate the storage and end-use of scrap tires, monitoring scrap tire flow and promoting responsible tire management as per the "3Rs" of recycling is the driver in many programs world-wide.

5.1 ALBERTA SCRAP TIRE STEWARDSHIP PROGRAM

5.1.1 OVERVIEW

Scrap tire disposal in the Alberta were unregulated until 1992; with a significant portion of the annual generation of scrap tires being landfilled or collected in tire stockpiles. This practice was not uncommon globally or in jurisdictions across North America, despite such practices creating significant environmental and public health hazards. Scrap tire management only became an area of significant concern following major tire fires in other jurisdictions in the late 80s and early 90s, forcing the government to consider effective management options.

The scrap tire program in Alberta was established in 1992 with the initial mandate of developing provincial alternatives for tire recycling. The Tire Recycling Management Board was the entity created to achieve the province's vision of a 'made-in-Alberta' solution for eliminating the backlog of scrap tire stockpiles and effectively managing the annual flow of scrap tires. Successor to the Tire Recycling and Management Regulation – Alberta Regulation 206/96, was the Tire Recycling Management Association (TRMA)—later titled Tire Recycling Alberta (TRA). Created in 1996, the TRA serves as the administrative body responsible for collecting ADS and allocating funds through mixed incentive programs, market development, and promotional campaigns to most effectively manage the program. Its current mission is:

"To manage scrap tire recycling in the best interests of Albertans."

TRA is a division of the Alberta Recycling Management Authority (ARMA), which is the Delegated Administrative Organization (DAO) responsible to oversee the management and recycling of scrap tires, waste electronics, and household hazardous waste in Alberta. It acts as a not-for-profit organization and reports directly to the Ministry of Environment.

Tires, as designated by the regulation are, *tires manufactured for the purpose of being used on the wheels of motor vehicles, trailers, tractors, implements of husbandry, off-highway vehicles, equipment or machinery.* This includes all tires used on highways and off, yet only highway vehicles are subject to Advanced Disposal Surcharge (ADS).

The program goals as outlined within ARMA's current business plan are:

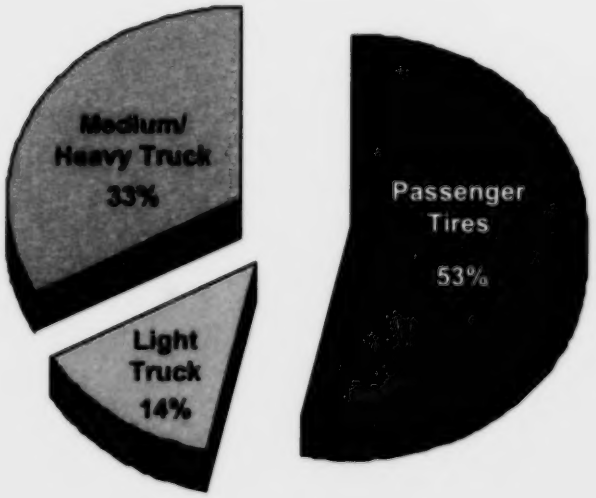
- Enable waste minimization and recycling solutions for all eligible scrap tires discarded by Albertans
- Scrap tires are recycled in an environmentally and socially responsible manner
- Scrap tire recycling is economically viable
- Albertans are aware of and support tire recycling
- Alberta communities benefit from tire recycling

For each goal, specific performance metrics have been determined, against which the program can monitor progress and set target objectives. Annual performance for each goal is described in detail within ARMA's Annual Report.

5.1.2 MARKET

Albertans own more light vehicles per capita than any other province in Canada. Statistics Canada estimates that approximately 34 billion vehicle kilometres (16,537 km/vehicle) were driven in the province by passenger and light trucks in 2003. Based on the Rubber Association of Canada's (RAC) reported tire shipments in Western Canada in 2004/05 and the distribution of vehicles by province, it is estimated that 2.97 million passenger and light truck tires were sold in Alberta during that period. The same calculations place the estimated number of medium and heavy truck tires sold in the province at 1.47 million tires. Exhibit 5-1 illustrates the distribution of tires shipped to Alberta, 62% of which were used in the replacement vehicle market.

Exhibit 5-1
Distribution of Tires Sold in Alberta - 2004



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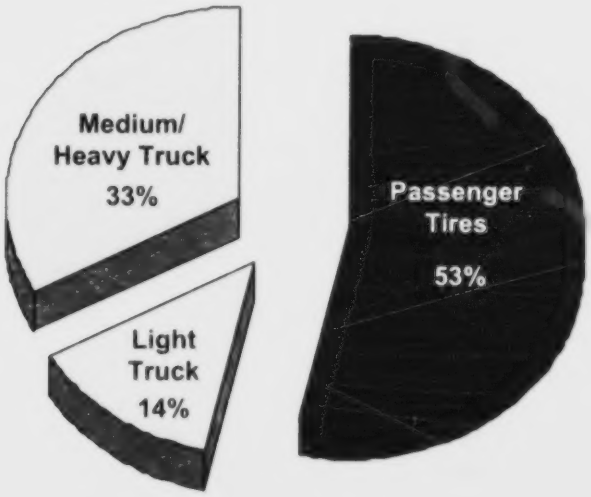


Not All Tires are Equal

All tires do not equally account for the amount of scrap tires produced in the province. A medium or commercial truck tire typically weighs five times that of a passenger tire, with light trucks weighing slightly more than passenger tires. Large industrial and agricultural tires are often much greater in size. For the purposes of this study, tires are compared in Passenger Tire Equivalents (PTE), unless otherwise noted. One PTE is equal to 10 kilogr ms.

Tire size is an important consideration, especially when managing large tires that require significantly more energy to process than passenger tires.

5.1.3 INCENTIVES

The costs to collect and process scrap tires in the province are such that it is unfeasible for the private sector to manage the current volumes of scrap tires as they cannot recover their costs at the current market rates for tire shred and crumb rubber. To this end, TRA as established an incentive program to ensure that provincial recyclers can sustain their operations. Table 5-1 details the incentives provided to processors and transporters under the Recycling Incentive Program.

Table 5-1
Albertan Scrap Tire Recycling Incentive Schedule

Activity	Cost / Tonne	Comment
SHRED PROGRAM		
Transportation	$50.00	Pick up & transportation of whole tires to processor
"Far-North" Transportation	$100.00	Actual cost of transportation is reimbursable to a maximum of $100 / tonne
Processing – 4" Shred	$100.00	For civil engineering applications, no dimension may exceed 4"
Processing – 2" Shred	$145.00	For civil engineering applications, no dimension may exceed 2"
"Far-North" Processing – 4" Shred	$150.00	An additional $50 per tonne is paid for Shred processed from whole tires
"Far-North" Processing – 2" Shred	$195.00	An additional $50 per tonne is paid for Shred processed from whole tires
"Far-North" Round Up Incentive	$100.00	Processors are required to pay communities $100 per tonne of tires received at their site.
OTR Processing – 4" Shred	$150.00	An additional $50 is payable on authorized processing of large OTR tires
OTR Processing – 2" Shred	$195.00	An additional $50 is payable on authorized processing of large OTR tires
Re-load Offset	$25.00	Approved processors north of Twp Line 38 who have a re-load yard south of Twp Line 26
CRUMB PROGRAM		
Processing – #3 Mesh or smaller	$110.00	Per tonne of shred processed to crumb; shred equal to crumb produced divided by 0.60
MANUFACTURED PRODUCT PROGRAM		
Manufactured Products	$100.00	Per tonne of crumb content in product that is supplied to third parties
FABRICATED PRODUCT PROGRAM		
Fabricated Products	$2.50	Per PTE for collection, processing and shipping of tires cut and reassembled into retail products
ALBERTA END-USE PROGRAM		
End-Use Programs	$25.00	A portion up to 50% of approved expenses to a maximum of $25.00 per tonne. Applicant must meet certain organization criteria.
TIRE TRANSFER HANDLING FEE PROGRAM		
Tire-Transfer	$25.00	For transportation of scrap tires to an eligible processor.

The effect of the incentive program is cumulative, which implicitly means that every tonne of crumb rubber content used in manufactured products could have received between $530 and $610 of support prior to being marketed. Should the product receive additional incentives for OTR or "Far-North" processing, it would further add to this value.

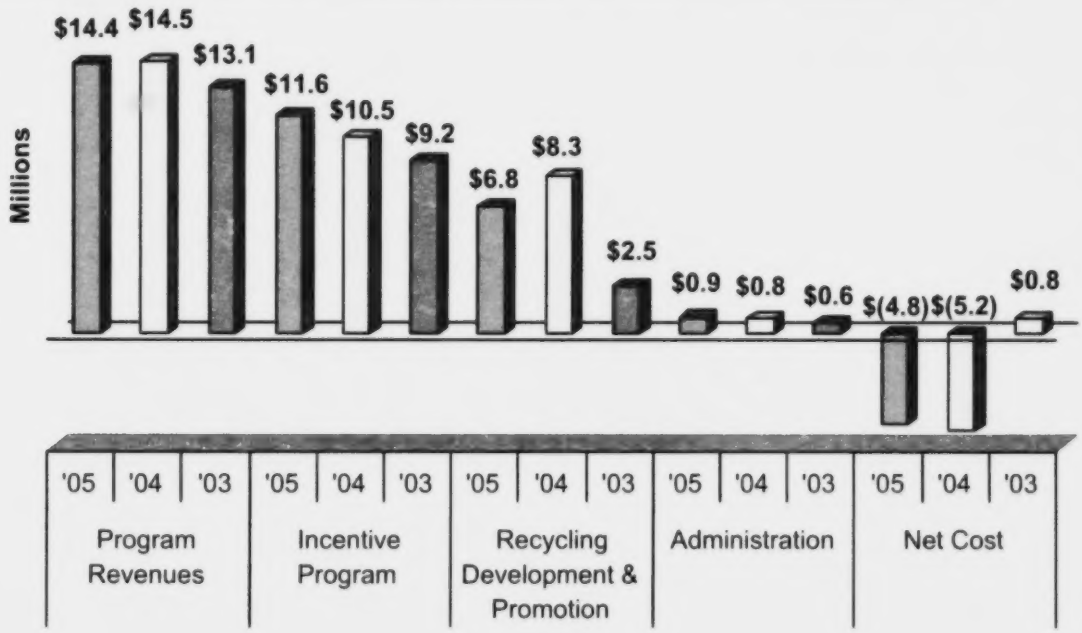
Supplementary allocations have been established to further target potential areas of opportunity where costs are increasingly great given variable parameters. Two such instances of these supplementary incentives are observed when recycling scrap tires located in northern communities (defined as those communities north of township line 80, 10 km south of Peace River) where greater logistics and operational costs must be offset, and secondly, when managing off-road tires (OTR), which are exempt from the ADS, but are still tires under the regulation, and need to be managed given their typically immense stature. For either supplementary allocation, processors receive an additional 50 dollar incentive per tonne toward the shred incentive program.

Agents capitalizing on program incentive payments are subject to multiple reporting and financial requirements laid out by TRA, and under no circumstances are incentive payments permitted to exceed the processor's expenditures incurred to recycle the tires.

FINANCIAL PERFORMANCE

The tire recycling program in Alberta is funded through a levy imposed at the point-of-sale for new tires and generates revenues through an investment program. Retailers collect a four dollar Advance Disposal Surcharge (ADS) from consumers per new tire sold and remit it to Tire Recycling Alberta. The ADS is currently set at the maximum it may impose under legislation. For the fiscal period ending March 31, 2005, revenue generated from the ADS totalled $13.7 million. A further $1.1 million was generated through an investment program. These revenues were allocated into the recycling incentive program, recycling development and promotion program, and administration. Exhibit 5-2 shows the magnitude of total allocations over the previous three fiscal years.

Exhibit 5-2
Magnitude of Historical Program Performance



The deficiency of revenue over expenses for the previous two years has totalled $10 million. This is because the program has invested heavily in market development and promotion over the same two periods. The program however continues to be economically viable due to the existing investment fund that has been setup to manage the surplus of funds accumulated over previous years. The 2005 ARMA Annual Report lists the value of TRA's investment fund at $20 million.

A detailed description of funding streams is described within the following three sections.

5.1.3.1 Recycling Incentive Program

In 2005, the Recycling Incentive Program administered by TRA paid out $10.9 million dollars to processors and transporters to add economic incentive to private enterprise, thereby ensuring the continued viability of recycling processors in the province. The cost to process the current annual volume of tires is such that without incentives, private scrap tire recycling in Alberta is not feasible. Exhibit 5-3 illustrates the cost distribution to operate the Recycling Incentive Program.

Exhibit 5-3
Recycling Incentive Program Cost Distribution

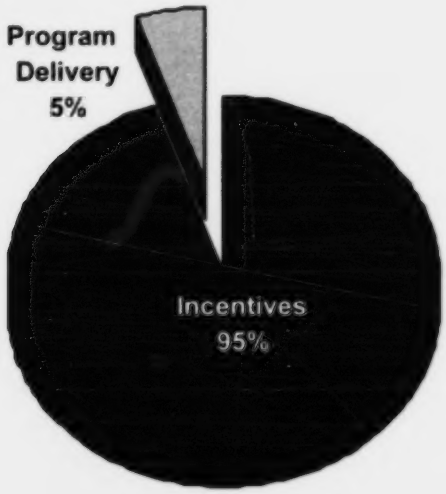
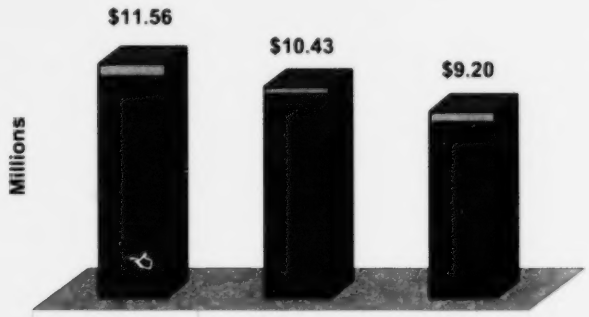


Exhibit 5-4 shows the operating expenses incurred to administer TRA's Recycling Incentive Program.

Exhibit 5-4
Historical Recycling Incentive Program Cost Distribution 2003-2005

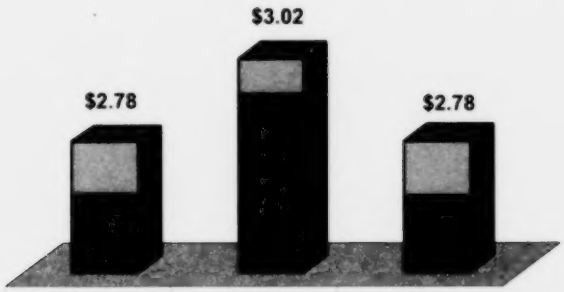


	2005	2004	2003
Program Delivery	$619,404	$356,322	$520,088
Incentives	$10,936,318	$10,116,863	$8,682,164

Over the past three year horizon, total program costs have increased steadily, with constant annual growth in the amount of incentives paid. The cost to deliver the program has exhibited a certain degree of variation.

Exhibit 5-5 shows the average operating expenses incurred per PTE to administer TRA's Recycling Incentive Program from 2003 to 2005.

Exhibit 5-5
Historical Recycling Incentive Program Cost Distribution Per PTE 2003-2005



	2005	2004	2003
Program Delivery	$0.15	$0.10	$0.16
Incentives	$2.63	$2.92	$2.62

In recent years, the average Recycling Incentive Program cost varied between $2.78 and $3.02 per PTE collected. The average program cost is directly proportional to the number of tires processed, as the number of tires processed over the three year period grew 25.6% with little impact to the average cost. As greater numbers of scrap tires are generated, program costs for incentives under the current regime can be expected to grow proportionately.

5.1.3.2 Recycling Development and Promotion

The purpose of the program is to enhance the benefits to Albertans and to enhance the tire recycling industry in the province. Currently, TRA allocates market development and public promotion funds into three primary streams:

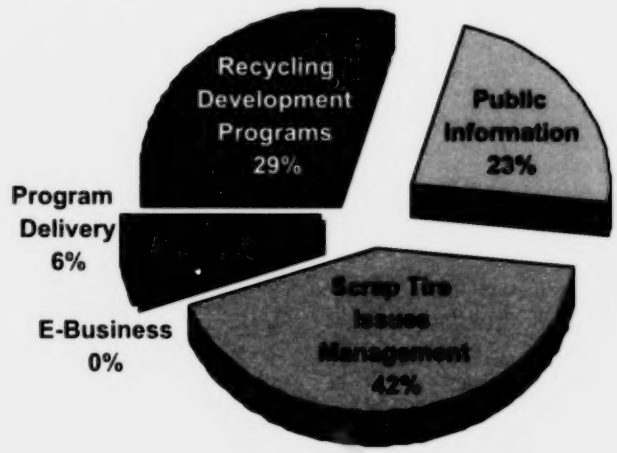
- Recycling Development Programs: Dedicated to the research, development, and technological expansion within the tire recycling industry, the program attempts to keep provincial recycling infrastructure and practices contemporary. It also attempts to identify innovative practices in the tire recycling industry, working with the Alberta Research Council and manufacturers.

- Public Information: TRA is also responsible in ensuring stakeholders and the public at large are aware of the program, and provides information to consumers on the benefits of tire maintenance.

- Scrap Tire Issues Management: Allocations for scrap tire issues management are used in the cleanup of stockpiled tires and in other ad hoc circumstances to contribute towards the reduced impact of scrap tires on the environment.

Investment in E-Business was an area of interest in previous years, with expenditures tailing off in 2005. The cost to deliver the program in 2005 was approximately 6% of the overall amount contributed towards the program. Exhibit 5-6 illustrates the distribution of program funds in fiscal 2005.

Exhibit 5-6
Recycling Development and Promotion Cost Distribution



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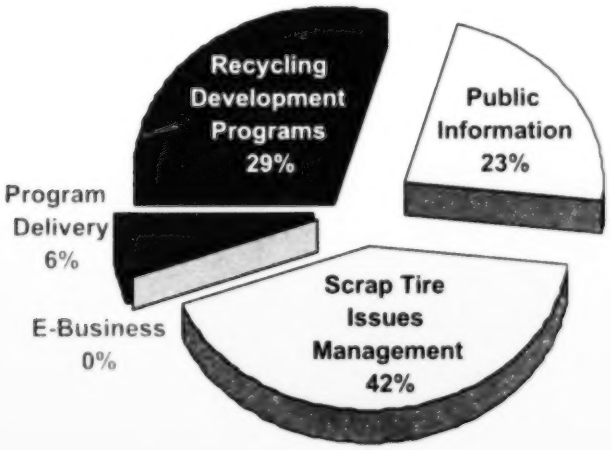
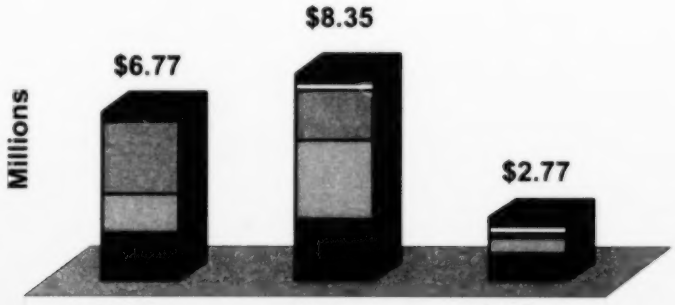


The current processor incentive regime established in the province is costly, yet the potential exists with a successful development program to improve the overall economics of the program, or improve the effectiveness of the provincial tire recycling program. Exhibit 5-7 illustrates the average operating expenses incurred to administer TRA's Recycling Development and Promotion Program from 2003 to 2005.

Exhibit 5-7
Historical Recycling Development and Promotion Program Cost Distribution 2003-2005

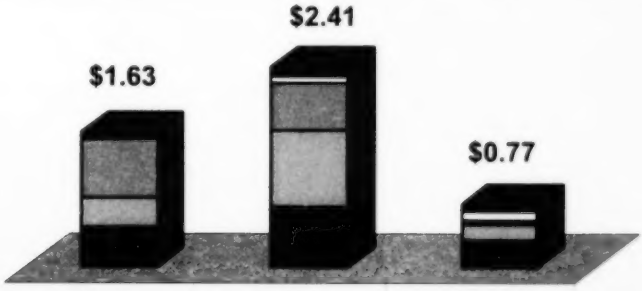


	2005	2004	2003
Program Delivery	$392,105	$429,901	$339,551
E-Business	$2,412	$256,954	$299,710
Scrap Tire Issues Management	$2,862,118	$2,004,310	$163,691
Public Information	$1,527,437	$3,158,834	$651,208
Recycling Development Programs	$1,988,451	$2,502,664	$1,084,957

Alberta has invested heavily in market development and public promotion in recent years, allocating in excess of $17.6 million over the past three fiscal years. It is the primary driver in the overall program experiencing a net deficit in 2004 and 2005.

Exhibit 5-8 illustrates the average operating expenses incurred per PTE to administer TRA's Recycling Development and Promotion Program from 2003 to 2005.

Exhibit 5-8
Historical Recycling Development and Promotion Program Cost Distribution per PTE 2003-2005



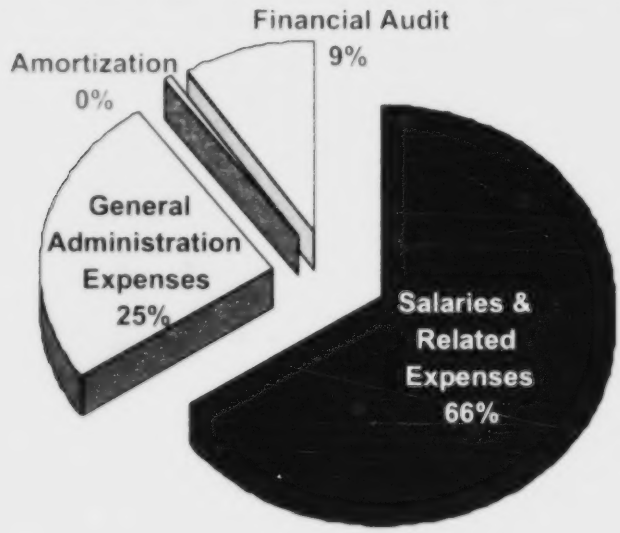
	2005	2004	2003
■ Program Delivery	$0.09	$0.12	$0.10
□ E-Business	$0.00	$0.07	$0.09
▣ Scrap Tire Issues Management	$0.69	$0.58	$0.05
▣ Public Information	$0.37	$0.91	$0.20
■ Recycling Development Programs	$0.48	$0.72	$0.33

On a per PTE basis, there is no relation between the volumes collected and expenditures on market development and promotion. Expenditures are rather opportunistic in nature with the program allocating funds to engage in reasonable development ventures when they present themselves. This type of program is very capital intensive, and with incentives and administration consuming 75-85% of annual revenues (77-94% of ADS revenues), additional resources are required to sustain the degree of investment contributed over the previous two years.

5.1.3.3 Program Administration

Effective administration plays an important role in the on-going operation of a successful recycling program. Identifying opportunities to streamline processes and reduce the burden of fixed costs on the program differentiates programs from one jurisdiction to the next. In fiscal 2005, TRA distributed $862,042 according to Exhibit 5-9.

Exhibit 5-9
Program Administration Cost Distribution



Salaries and general expenses account for the majority of costs incurred in program administration, with the cost to conduct a financial audit contributing significantly to administrative activities.

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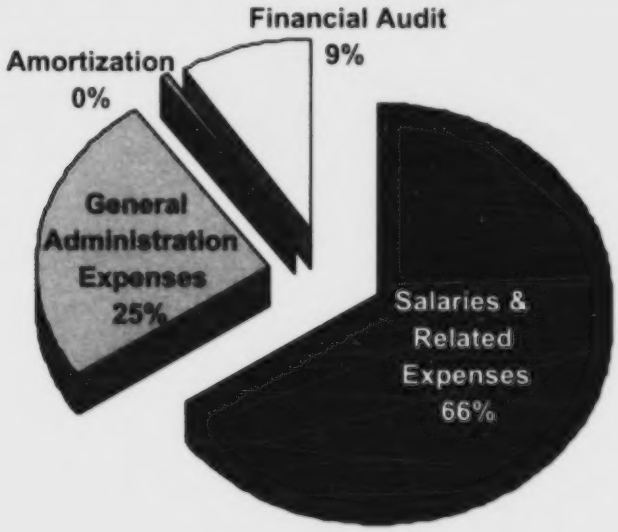
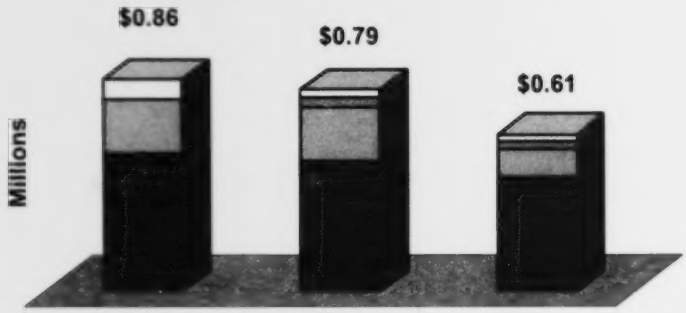


Salaries and general expenses account for the majority of costs incurred in program administration, with the cost to conduct a financial audit contributing significantly to administrative activities.

Exhibit 5-10 shows the average operating expenses incurred to administer TRA's program from 2003 to 2005.

Exhibit 5-10
Historical Program Administration Cost Distribution 2003-2005

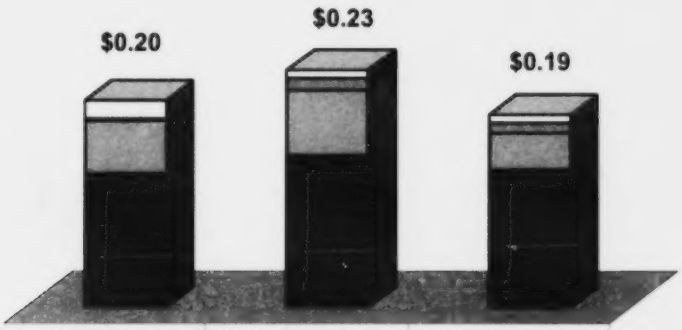


	2005	2004	2003
Financial Audit	$76,905	$28,691	$25,000
Amortization	$3,243	$40,235	$29,763
General Administration Expenses	$208,854	$214,393	$115,360
Salaries & Related Expenses	$541,040	$508,663	$443,746

Administrative expenses have appreciated since 2003, increasing 40% over that period. Salaries are a primary cost driver that would be expected given the nature of the organization. Given the limited magnitude of administrative costs within the program, significant increases in a particular expense greatly affect the overall performance—an instance that is observed in 2005 when a 168% increase in the expense to perform a financial audit was observed.

Exhibit 5-11 illustrates the average operating expenses incurred per PTE to administer TRA's program.

Exhibit 5-11
Historical Program Administration Cost Distribution per PTE 2003-2005



	2005	2004	2003
Financial Audit	$0.02	$0.01	$0.01
Amortization	$0.00	$0.01	$0.01
General Administration Expenses	$0.05	$0.06	$0.03
Salaries & Related Expenses	$0.13	$0.15	$0.13

When administrative costs are analyzed against the reported amount of PTEs collected, we find that administrative expenses are relatively constant. This observance is problematic given administration is normally independent of processing volumes and it would be expected that the marginal cost to administer a program with greater volumes would decrease.

5.1.4 END-USE APPLICATION

The structure of the end-use incentive program and TRA program objectives promote certain end-use applications for scrap tires, while diminishing others. The applications of tires processed in Alberta can be broken down into the following three categories:

- **Civil Engineering:** Civil engineering applications use shredded tires in a variety of uses including its use as a substitute for rock or gravel aggregate. This use aligns with TRA's goal of saving non-renewable resources and is exhibited by its application in landfill leachate collection systems, where in 2004/05, 25,000 tonnes of shred was used rather than the 100,000 tonne equivalent of washed rock.

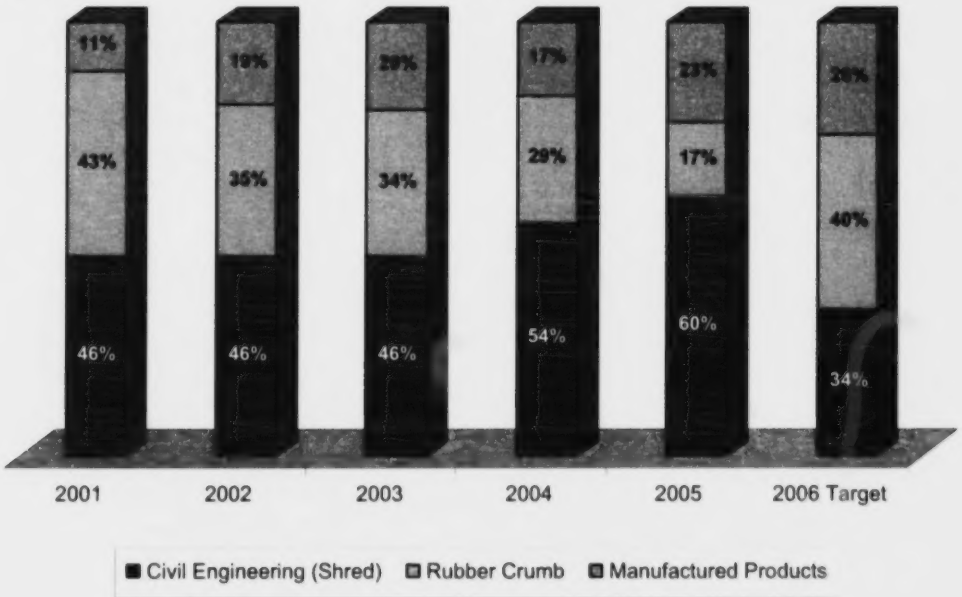
- **Rubber Crumb:** Rubber crumb is produced from tire shred and has many applications. It is primarily used in the production of manufactured products or as a substitute for sand in playground environments. It can also be sold in the marketplace to be used in products having crumb content.

- **Manufactured Products:** Manufactured products are made from rubber crumb and used in a multitude of product classes including moulded products like bricks, tiles and highway pylon bases, and mats used in agriculture and oilfield applications.

Stakeholders have expressly indicated opposition to burning scrap tires as Tire-Derived Fuel; therefore, as a matter of policy, scrap tires are not used for energy recovery in Alberta. Exhibit 5-12 shows the historical distribution of end-use application in Alberta since fiscal 2001.

1.1 EXHIBIT 5-12

Alberta public/end-users pay and Advance Disposal Surcharge (ADS) per product to Alberta retailers at the point



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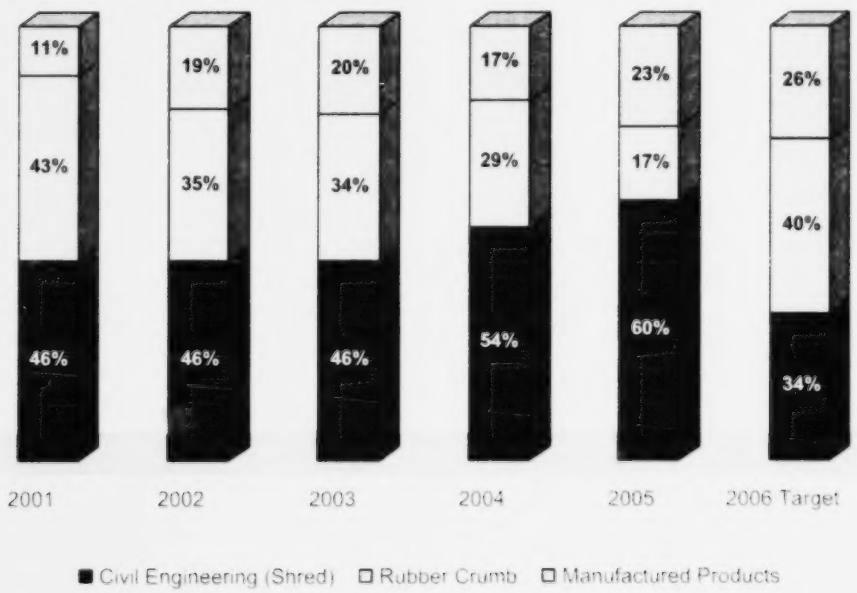
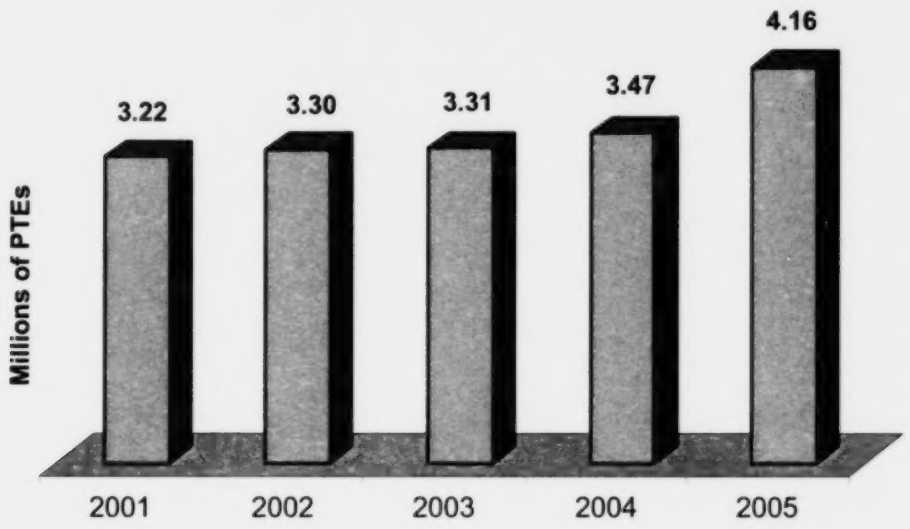


As observed in TRA's 2005/06 target, the program wishes to move forward in the coming years and further develop value-added products like crumb rubber and manufactured products, and reduce the amount of tire shred used in civil engineering products, even though a recent upward trend is observed in the use of tire shred in civil engineering projects. Exhibit 5-13 illustrates the magnitude of passenger tire equivalents collected in Alberta from 2001-2005.

Exhibit 5-13
Historical End-Use Application of Scrap Tire Products 2003-2005



The Rubber Association of Canada (RAC) estimated that the total amount of scrap tires generated from highway vehicles in 2004 in Alberta to be four million PTEs. This figure is a percentage of the total amount of tires shipped and sold in the province and is the best approximation for the number of scrap tires generated in the jurisdiction available. TRA reported that it collected and processed 4.16 million PTEs or 1.04 tires recycled per tire generated. The program's ability to recycle more tires than generated is due to the on-going management of stockpiled tires. During fiscal 2005, a private stockpile of 500,000 scrap tires was eliminated.

The number of stockpiled tires in Alberta is currently unknown, although TRA is attempting to engage municipal waste management officials in an attempt to identify and quantify remaining stockpiles in the province. It is estimated that magnitude of stockpiled tires is diminutive.

5.2 OVERVIEW OF NORTH AMERICAN AND EUROPEAN SCRAP TIRE STEWARDSHIP PROGRAMS

Tire recycling programs in North America and Europe have been established in an attempt to manage the growing concerns surrounding the backlog of stockpiled scrap tires and the resulting environmental and health hazards caused by collecting and storing tires in large volumes. Worldwide, the answer to managing scrap tires differs widely, from those jurisdictions who continue to allow tires in landfills and are unregulated, to those who oblige industry to manage tires from cradle-to-grave by legislation.

Multiple governance models exist, as do various collection mechanisms.

Canadian Programs

Canadian tire recycling initiatives have only come into existence over the past 15 years, with the catalyst for many programs being the Hagersville tire fire of 1990, in which 14 million tires burned uncontrolled for 17 days, causing unknown environmental damage in and around southern Ontario. As of 2005, all provinces have made efforts to divert and responsibly manage scrap tires, and currently nine of ten provinces have active programs, as does the Yukon Territory.

Table 5-2 captures the date of inception for provincial scrap tire recycling programs Canada-wide.

Table 4-2
Canadian Scrap Tire Recycling Programs

Jurisdiction	Inception	Comment	Jurisdiction	Inception	Comment
British Columbia	1991	To restructure to producer responsibility organization	New Brunswick	1996	
Alberta	1992		Nova Scotia	1997	
Saskatchewan	1995		Prince Edward Island	1999	
Manitoba	1992		Newfoundland	2002	
Ontario	1989	Program rescinded in '93 - WDO to start new program	Yukon		
Quebec	1993				

5.2.1 BRITISH COLUMBIA

The longest running active program in Canada was established in British Columbia. Currently the province collects a three dollar levy on the sale of all highway vehicle tires in the province and subsidizes end-use processors to manage scrap tires. The program pays transporters on a structured per kilometre rate, and has established a structured incentive schedule to support end-use processors based on how the scrap tire is used. The program also pays a subsidy to end-users to use scrap tires for tire derived fuel. Off-the-road (OTR) tires are outside the scope of this program—a large percentage is exported to be managed in the United States.

At the present time, the B.C. program is contemplating a transition in governance structure, identifying industry brandowners as the agent responsible to manage post-consumer tires. Furthermore, discussions have also expressed the desire to increase tire levies in the province.

5.2.2 SASKATCHEWAN

The program in Saskatchewan collects tire levies on all tires sold in the province including on and off highway vehicles. The fee collected is structured to reflect the escalating cost to process tires as they become larger. The fee charged on the sale of traditional passenger vehicle tires is $3.50 and increases to $35.00 on the sale of OTR tires. The Saskatchewan Scrap Tire Corporation is the Delegated Administrative Authority (DAO) who provides economic incentives to transporters and processors in the province. Saskatchewan is the lone Canadian program that collects a levy on OTR tires, which in the program are exported the U.S. for TDF.

Current challenges are plaguing the program, as processors are voicing concerns with the current subsidization regime and economic viability of operating within the province. The program may have to look to neighbouring provinces for processing capacity in the future.

5.2.3 MANITOBA

In 1992, Manitoba established its scrap tire management program. The program includes a levy on retail sales of all new highway vehicle tires, which is collected by the Manitoba Tire Stewardship Board. The current rate of $2.80 per tire funds the program that subsidizes end-use processors and other incentive programs. Landfills in the province are eligible to receive $0.50 per scrap tire if they are diverted and responsibly stored to be collected by processors.

The program's structured incentive program only on-road tires, and also supports tires exported to be consumed in TDF applications. OTRs in the province are collected, and often exported to be managed in the U.S.

5.2.4 ONTARIO

Ontario was the first province to establish a scrap tire program in Canada, imposing a $5 levy on new tires sold within the province. The levy was eliminated in 1993 and has yet to re-establish a scrap tire management program. Following the Waste Diversion Act (2002), Waste Diversion Ontario (WDO) has been attempting to institute a program in collaboration with brandowners—an Industry Funding Organization, or IFO, was subsequently established to represent brandowners (Ontario Tire Stewardship).

Progress in establishing the program has been time-consuming and stakeholders have indicated that full implementation may take up to two more years.

5.2.5 QUEBEC

The scrap tire management program in Quebec was established in 1993, and was later expanded to allow for a $3.00 levy to be imposed on the sale of tires sold in the province. Recyc-Quebec is the DAO responsible for overseeing the operation of the program and provides economic incentive to recyclers. The program only considers on-road tires measuring 24.5 inches in diameter (rim) and less.

The current plan for managing scrap tires in the province calls for the elimination of all stockpiles by 2008 and bans tires from being either burned or landfilled. Considered within the incentive program is a credit paid to manufacturers who retread tires.

5.2.6 NEW BRUNSWICK

The program within New Brunswick collects a structured levy on passenger tires (rim size 8-17 inches) and truck tires (17-24.5 inches) of $3.00 and $9.00 respectively. The New Brunswick Tire Stewardship Board (NBTSB) is the DAO mandated to collect fees and support the province's processor.

At the current time, the province is considering re-organizing certain environmental programs to be managed within a single multi-material DAO, which could include scrap tires.

5.2.7 NOVA SCOTIA

The province of Nova Scotia has mandated the Resource Recovery Fund Board (RRFB) to manage scrap tires within the program. The organization also oversees the beverage container recycling program, the household hazardous waste program, and the derelict vehicle program. The RRFB collects funds, and allocates funding to transporters and processors to effectively manage the on-road scrap tires generated in that province. The program also contributes grant funding to organizations that use processed tires in end-use applications.

5.2.8 PRINCE EDWARD ISLAND

In 1999, the Island Waste Management Corporation was legislated to manage on-road scrap tires in the province. Given the limited volume of scrap tire generated in the province, they are principally baled to be exported to processors in neighbouring provinces or used in civil engineering programs, including seawall stabilization projects.

Originally set at $2.00, the tire levy imposed in that jurisdiction was increased to $4.00 in 2005 to counteract the funding shortfall the program had been experiencing in recent years—which was subsequently financed by provincial funds.

5.2.9 NEWFOUNDLAND

The Multi-Materials Stewardship Board (MMSB) of Newfoundland is the DAO established to manage an environmentally responsible recycling alternative for scrap tires in that province. Established in 2002, the program is challenged by the geographic and demographic barriers when recycling scrap tires and is currently attempting to enter into contracts with recyclers to manage annual volumes of tires within that province.

Considering the limited volumes and end-use markets in that province, economically viable options in the province will continue to be a challenge to the program in forth-coming years, as it attempts to expand its collection and recycling infrastructure and develop end-use markets.

5.2.10 YUKON

The program for managing scrap tires in the Yukon is administered by the territory's environmental ministry, which has imposed a $5.00 levy on all on-road tires sold in that jurisdiction. The fee funds the collection and diversion of scrap tires, and eventually contributes to the transportation of tires to neighbouring Alberta for processing.

American Programs

5.2.11 OVERVIEW

Programs in the United States have been developed state-by-state to mitigate the risk of extensive tire piles that have built up over recent decades. Some state programs lack effectiveness and have been unable to tackle scrap tire issues, while others have all but completely eliminated tire piles within their jurisdiction and continue to manage effective programs.

State agencies oversee programs across the country, often falling within the authority of the department charged with the administration of environmental protection. In some instances, collaboration with other departments can occur, either to develop end-use markets, or promote public health and safety.

In total, 36 state-run programs exist in the U.S. Other statistics are described in Table 5-3

Table 4-3
American Scrap Tire Recycling Statistics

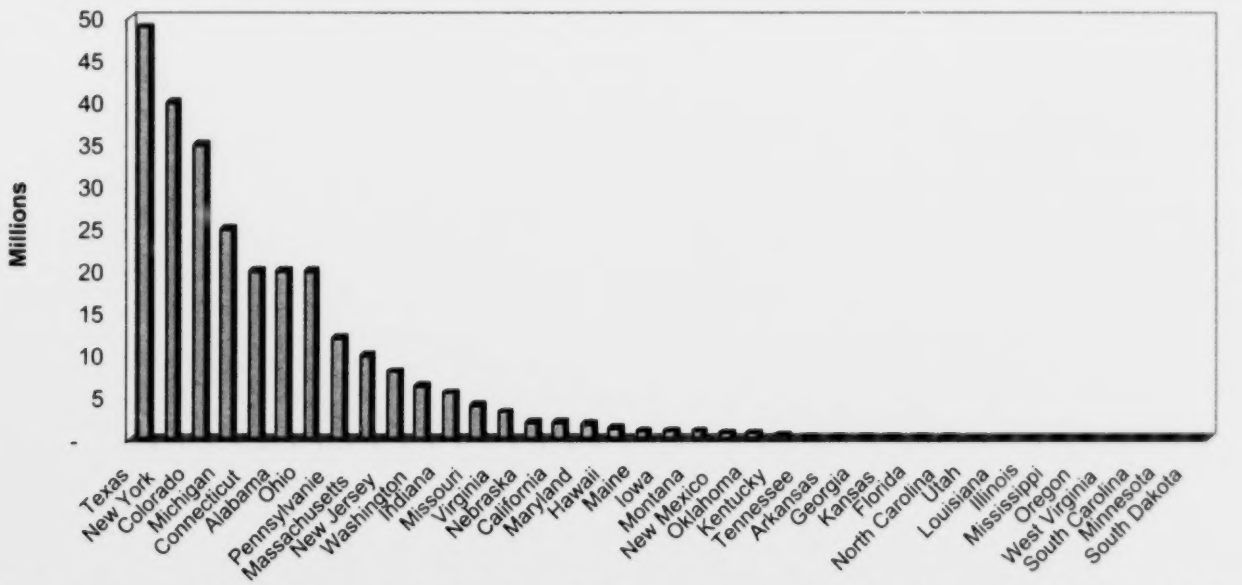
Statistic	Description
	U.S. OVERVIEW
290,190,000	Scrap Tires Generated (1 per capita)
274,860,000	Scrap Tires in Stockpiles
	STATE QUICK FACTS
35	States Collect Fees
28	States Collect Fees via Tire Retailers (Levy)
6	States Collect Fees via Vehicle Registration or New Car Sales
2	States Collect Fees via Tire Importers or Wholesalers
21	States have dedicated scrap tire funds
5	States prevent tire dealers from charging additional fees for tire disposal
35	States require tire collectors to be registered/permitted
46	States require tire processors / disposal facilities to be registered/permitted
37	States ban whole tires from landfills
9	States ban cut / shredded tires from landfills
36	States have stockpile clean-up programs
19	States have active stockpile clean-up programs
32	States provide grants and/or loans for scrap tire processes, recyclers
34	States have markets sufficient to handle annual generation
19	States have market development incentives

5.2.12 STOCKPILE ABATEMENT

Stockpile abatement is the number one driver of scrap tire programs in the U.S. The U.S. Rubber Manufacturer's Association reported that 21 of 40 states had either greater amounts of tires stockpiled or had made no progress in abating existing stockpiles between 2001 and 2003. Tracking and monitoring the flow of past and present scrap tires is difficult which is highlighted by the fact that many states are identifying new tire piles as they abate previous ones, which outlines the problem.

Different schools of thought exist on how to fund stockpile abatement, with some programs funding the entirety or a portion of the clean-up for historic piles, while others prefer an avenue of enforcement, which forces land owners to incur the expense to remediate the site. Regardless of how tire piles are managed, stockpiles pose significant environmental and public safety hazards, as they are a potent source of combustible toxic substances that are not easily extinguished and costly to clean up. Moreover, they provide excellent habitat and ideal breeding grounds for disease carrying insects, for example mosquitoes carrying West Nile Virus. Exhibit 5-14 illustrates the accumulation of stockpiled tires in the United States in 2003.

Exhibit 5-14
Number of Tires Stockpiles by US State - 2003



Current estimates of stockpiled tires in the U.S. situate 91% of the total amount of piles in 11 states representing 37.5% of the American population and of these jurisdictions eight have been found to not be operating an active program. Furthermore, these states correspond to 11 of the top 14 states in stockpiled tires per capita.

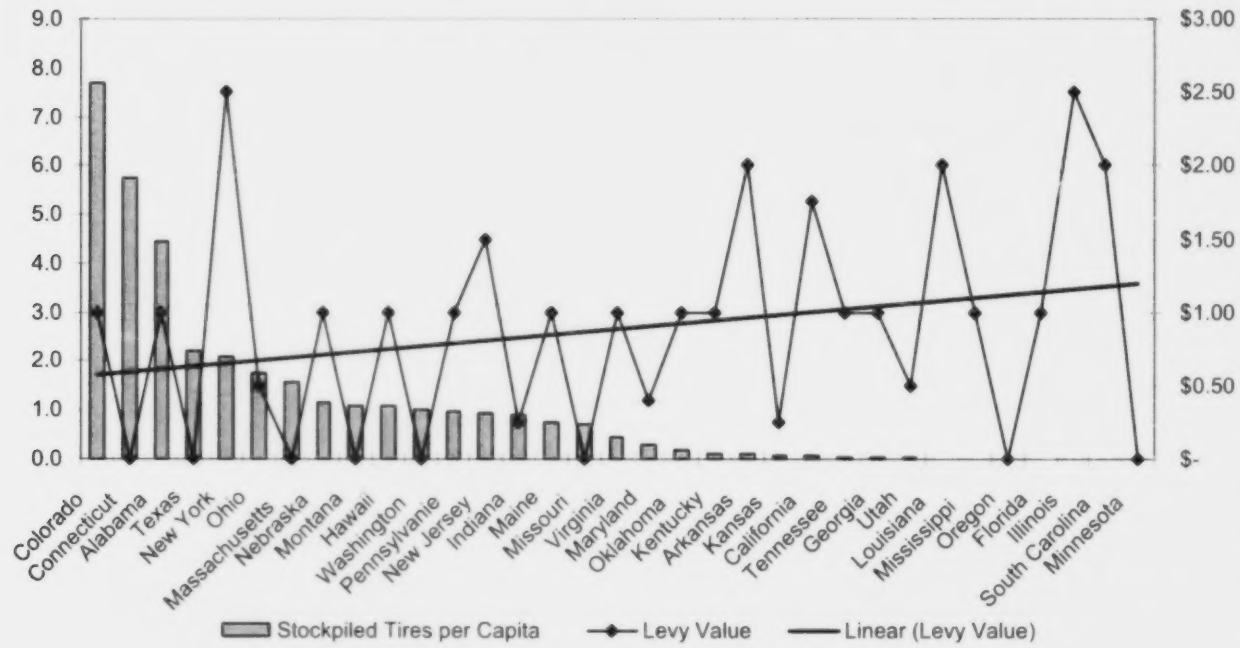
Considering that in 1990, approximately one billion tires were stored in stockpiles, significant progress has been made on the front; yet considerable challenges still lay ahead with legislative support and funding issues becoming prevalent concerns.

5.2.13 LEVY

To fund the clean-up, remediation, and enforcement activities, as well as program administration and agent permitting, 35 states have enabled revenue generating legislation, calling for the collection of fees through certain sources. The most popular method for generating revenues is through the imposition of a levy at the point of sale on tires, which is collected by retailers. This conforms to the user-pay model, in which consumers bear the full price of the program.

Exhibit 5-15 demonstrates the negative relationship between stockpiled tires per capita and the levy imposed on tire sales.

Exhibit 5-15
Stockpiled Tires per Capita as a Functions of Levy Values



New York has only recently implemented its waste tire stockpile plan, which calls for a $2.50 levy to be paid by consumers per new tire purchased.

Other funding models charge consumers a supplementary fee during vehicle registration, or when assuming title of a newly purchased vehicle. In two instances, state programs charged brandowners for tires sold in the market, with Hawaii requiring importers to pay $1.00 per tire brought into the state, and Ohio requires wholesalers to pay $0.50 per tire sold.

Table 5-4 lists the amount states charge consumers in order to fund their scrap tire management programs.

Table 5-4
US Tire Levy Values

State	Levy / Fee ($U.S.)	State	Levy / Fee ($U.S.)	State	Levy / Fee ($U.S.)
Alabama	$1.00 / tire	**Louisiana**	$2.00 / tire	**Ohio**	$1.00 / tire (wholesaler)
Alaska	$2.50 / tire	**Maine**		**Oklahoma**	$1.00 / passenger tire $3.50 / truck tire
Arizona	2% of price / tire	**Maryland**	$1.50 / tire	**Oregon**	
Arkansas	$2.00 / passenger tire $3.00 / truck tire	**Massachusetts**		**Pennsylvania**	$1.00 / tire
California	$1.75 / tire	**Michigan**	$1.50 / registration	**Rhode Island**	$0.50 / tire
Colorado	$1.00 / tire	**Minnesota**		**South Carolina**	$2.00 / tire
Connecticut		**Mississippi**	$1.00 / tire	**South Dakota**	$0.25 / registration
Delaware		**Missouri**	$0.50 / tire *as of Oct, '05	**Tennessee**	$1.00 / tire
Florida	$1.00 / tire	**Montana**		**Texas**	
Georgia	$1.00 / tire	**Nebraska**	$1.00 / tire	**Utah**	$1.00 / tire
Hawaii	$1.00 / tire (importer)	**Nevada**	$1.00 / tire	**Vermont**	
Idaho		**New Hampshire**		**Virginia**	$1.00 / tire
Illinois	$2.50 / tire	**New Jersey**	$1.50 / tire	**Washington**	
Indiana	$0.25 / tire	**New Mexico**	$1.50 / tire	**West Virginia**	$5.00 / registration
Iowa	20% of $5 Registration	**New York**	$2.50 / tire	**Wisconsin**	
Kansas	$0.25 / tire	**North Carolina**	2% of price / tire	**Wyoming**	
Kentucky	$1.00 / tire	**North Dakota**			

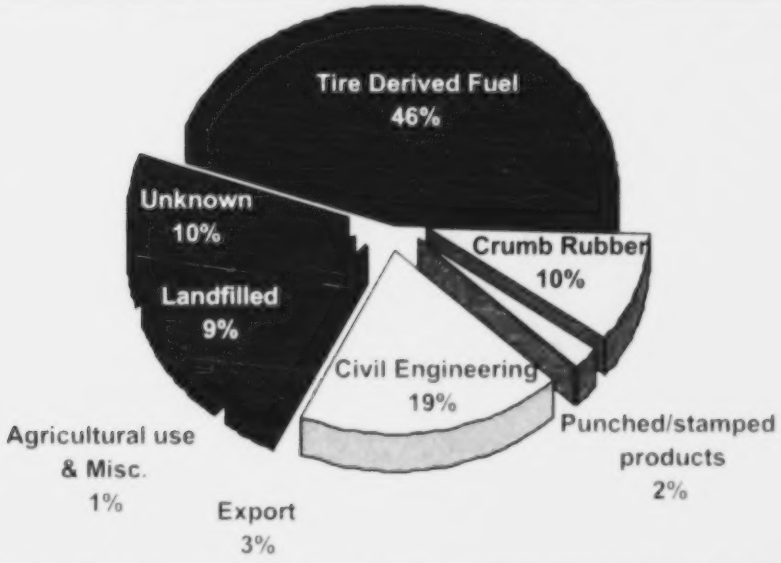
Many states collect these fees under the guise of environmental protection, although only a portion of the revenues collected are diverted into scrap tire management. These states retain funds for the general fund, or divert funds to other environmental or health uses.

5.2.14 END-USE APPLICATIONS

The United States prefers to allow scrap tires to flow towards free-market opportunities whenever possible. Scrap tires are most economical when used in energy recovery applications, and this is prevalent in many states with the widespread use of shredded and chipped tires in Tire-Derived Fuel (TDF). Civil engineering applications are the next most popular use, with shred being used in many different applications as an aggregate substitute, including in embankments on highway overpasses and leachate filtration in landfills. Value-added products produced from crumb rubber are not popular due to the costly nature of the product, but are widely used in southern states in asphalt additives. A significant amount of tires are still landfilled and unaccounted for – totalling 19% of the roughly 290 million scrap tires generated annually in the America.

Exhibit 5-16 shows how the approximately 290 million U.S. scrap tires were managed post-consumption in 2003.

Exhibit 4-16
U.S. Scrap Tire End-Use Applications – 2003



Over the last 15 years, scrap tire end-use markets have strengthened considerably to handle the increasing amount of tires being made available through state stockpile abatement programs. Originally, tires were only accepted by users who burned tires for energy generation. Thereafter, as more state programs were implemented, alternative markets for the supplemental tire supply increased as well. In 2003, 94.1 million tires were recycled in the U.S. when 13 years earlier there was no such market. Exhibits 5-17 and 5-18 illustrate growing end-use markets in the United States and the market distribution between 1990 and 2003.

Markets in many states struggle to exist, with many processors leaving the market due to limited financial benefit incurred through operations.

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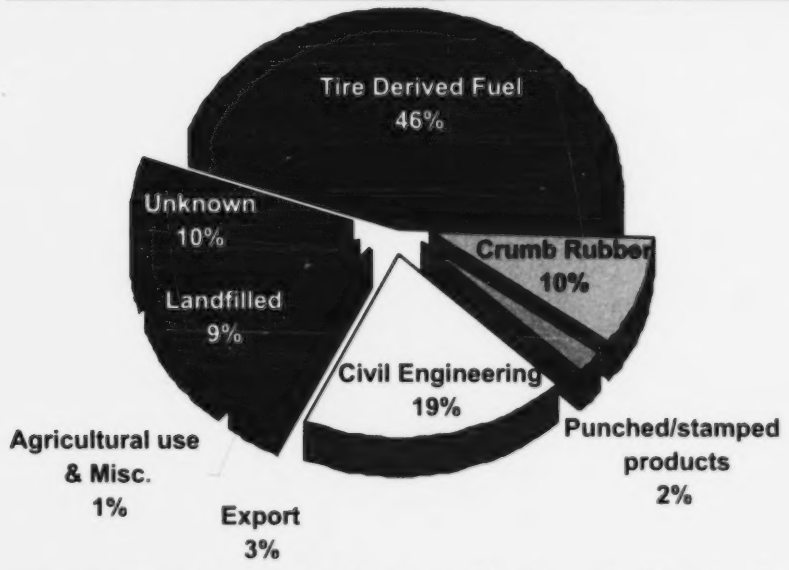

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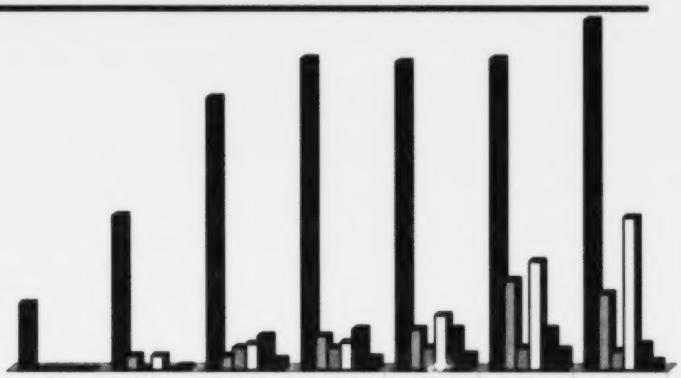
Exhibit 4-17
Magnitude of U.S. Scrap Tire End-Use Markets – 1990-2003



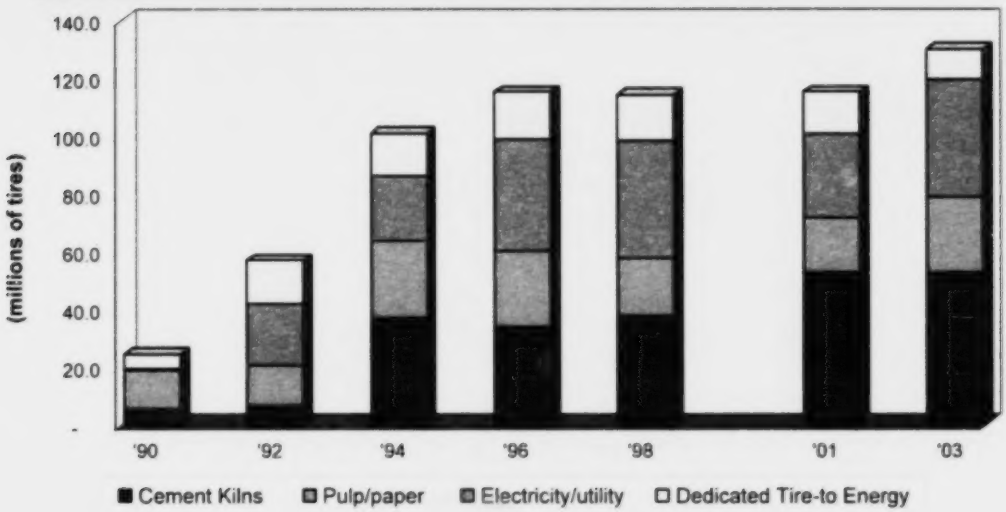
	'90	'92	'94	'96	'98	'01	'03
TDF	24.5	57.0	101.0	115.0	114.0	115.0	129.7
Crumb Rubber	-	5.0	4.5	12.5	15.0	33.0	28.2
Punched / Stamped	-	-	8.0	8.0	8.0	8.0	6.5
Civil Engineering	-	5.0	9.0	10.0	20.0	40.0	56.4
Export	-	-	12.5	15.0	15.0	15.0	9.0
Agriculture	-	1.0	3.5	4.0	5.5	7.0	3.0

Exhibit 4-18
Distribution of U.S. Scrap Tire End-Use Markets – 1990-2003

	'90	'92	'94	'96	'98	'01	'03
Agricultural use & Misc.	0%	1%	3%	2%	3%	3%	1%
Export	0%	0%	9%	9%	8%	7%	4%
Civil Engineering	0%	7%	6%	6%	11%	18%	24%
Punched/stamped products	0%	0%	6%	5%	5%	4%	3%
Crumb Rubber	0%	7%	3%	8%	8%	15%	12%
Tire Derived Fuel	100%	84%	73%	70%	64%	53%	56%

Though the importance of TDF alternatives in the U.S. have reduced in relation to other scrap tire applications, the overall volume used has appreciated five fold since 1990. Exhibit 5-19 clarifies the distribution of TDF markets in the United States.

Exhibit 4-19
Distribution of U.S. Scrap Tire End-Use Markets – 1990-2003



- **Cement Kilns:** In 2003, 65 cement kilns burned 53 million scrap tires. Scrap tires are routinely used in the cement industry due to positive economics in relation to rising energy costs and reduced nitrogen oxide emissions (when compared to other hydrocarbons).

- **Pulp/Paper:** During 2003, 17 pulp and paper mill boilers operated using 26 million scrap tires. In addition to the high cost of traditional fossil fuels, the use of TDF increased as other alternative markets decreased, for example bark materials were diverted into mulch markets.

- **Electricity/Utility:** At the conclusion of 2003, 13 utility boilers and 15 industrial boilers had consumed 30.7 million scrap tires. These markets have yet to stabilize due in part to the current business environment and federal air emission regulatory requirements. Taken into consideration is that TDF contains more sulphur than low-sulphur coal.

- **Dedicated Tire-to-Energy:** One facility was dedicated to burning TDF for energy in 2003. The 25 MW facilities in Connecticut used between 10 and 11 million tires during the year. As TDF is often usable as a coal substitute, and as energy commodities rise in price, scrap tires become increasingly popular as a fuel source it is foreseeable that increasing numbers of power generators will use either limited or significant volumes in the future.

Projections estimate that 151 million tires will be used in TDF applications in 2005. Upward trends are expected in the cement, pulp and paper, industrial, and dedicated tire-to-energy markets.

5.3 INTERNATIONAL PROGRAMS

5.3.1 OVERVIEW

Scrap tire issues have arisen around the globe, particularly in countries having a backlog of stockpiled tires or having a dense population demographic—and the issue of scrap tire management becomes one of volume. The first instance of observed scrap tire management was reported to be in Germany during the late 70s, when world energy prices rose dramatically, making TDF applications economical. In 1989, scrap tires (spelled "tyres" in Europe and abroad), were designated as a priority waste stream in Europe. Attempts to compile an environmental directive for scrap tires lasted until 1999 and 2000 when three directives were established having direct consequence on the management of scrap tires.

- **Landfill Directive:** The impact of the landfill directive is twofold. First, as of 2003, whole tires were banned from landfills. Effective 2006, tires will no longer be allowed into landfills in their shredded form. Estimates from the European Tyre Recycling Association (ETRA) predict that an additional 687,670 tires will have to be responsibly managed in member nations. The ultimate outcome of the directive is that there will be zero landfilling of scrap tires will the exclusion of bicycle tires, tires greater than 1.4 metres, or tires used in landfills for civil engineering purposes.

- **End-of Life Vehicle Directive:** The end-of life vehicle directive was drafted to manage the growing number of vehicles who have outlived their lifespan, and are no longer useful. It outlines that there shall be no landfilling of components and materials, spare and replacement parts, with the exception of motor tricycles. By direct consequence, scrap tires fall within this category. The objectives outlined within the directive establish that by 2006, reuse and recovery of designated material should reach 85% totally 80% of the vehicle weight, and by 2015 the stated objective is to reach 95%. The ETRA forecasts an additional 30 million tires will need to be managed to reach the stated objective.

- **Incineration of Waste Directive:** The consequence of the incineration of waste directive impacts the consumption of tires in TDF applications. It outlines that older cement kilns that cannot be updated to meet new emission by standards will be decommissioned and as of 2008, tires will no longer be allowed to be burned as a secondary fuel. Their exists the potential for all 'wet-kilns' to be closed, which presently accounts for approximately 20% of the scrap tires consumed in European cement kilns.

These and nine other E.U. directives all work towards the harmonization of environmental and waste management objectives across member states.

5.3.2 PRODUCER RESPONSIBILITY

Two principal schemes have risen when in comes to the management, administration, and responsibility of scrap tires in Europe.

- **Free Market:** In the free market system, scrap tires are managed assuming economically viable end-use markets exist for scrap tire applications and will direct the flow of scrap tires. These programs are typically government-run or administered by a delegated administrative organization (DAO), and these entities often work in collaboration with many stakeholders.

- **Take-back:** The take-back scheme, names brandowners as the stakeholder who assumes responsibility for the scrap tires it sells on the market. As such, legislation is drafted to impose requirements on brandowners who must consider the end-use applications of the products they place in the market annually.

Recently, brandowners have accepted the responsibility for managing scrap tires in many jurisdictions, and the take-back system has become increasingly popular. Scandinavian countries were the first to introduce the concept of producer responsibility on scrap tires (as well as other products having environmental ramification upon completion of its useful lifecycle), and are the foundation upon which many newer producer responsibility organizations are being established. In this system, brandowners are typically free to set environmental levies on retail tires sold.

5.3.3 LEVY

Seven states in Europe have mandated levies for scrap tire collection, processing, and research and development. Of these jurisdictions, the schemes employed are all structured fee schedules that reflect the escalating cost to manage larger tires. Of note, many programs include a levy on retreaded vehicle tires. Six of these programs are detailed in Table 5-5.

Table 5-5
European Tire Levy Schedules

Tire Description	Jurisdiction / Value		
Denmark			
	DKK	€	$ CDN
New / used <7.00-15 or 255-15, incl. cars	8.00	1.07	$ 1.53
Retread <7.00-15 or 255-15, incl. cars	4.00	0.54	$ 0.76
New / used <7.00-15 or 255-15 & <19.5", except cars	20.00	2.68	$ 3.82
Retread <7.00-15 or 255-15 & <19.5", except cars	10.00	1.34	$ 1.91
New / used =>19.5" & <24", except cars	60.00	8.04	$ 11.46
Retread =>19.5" & <24", except cars	30.00	4.02	$ 5.73
New / used =>24", incl. cars	180.00	24.12	$ 34.37
Retread =>24", incl. cars	180.00	24.12	$ 34.37
Belgium			
		€	$ CDN
Passenger and Light Truck		2.40	$ 3.42
Medium Truck		10.30	$ 14.68
Sweden			
	SEK	€	$ CDN
Car & Motorcycle Tyres	13.00	1.39	$ 1.98
Swedish Retreaded Car Tyres	8.00	0.86	$ 1.22
Construction Vehicle and Large Tractor Tyres	250.00	26.78	$ 38.17
Truck Tyres	80.00	8.57	$ 12.21
Construction Tyres Larger than 29"	800	85.71	$ 122.13
Finland			
		€	$ CDN
Moped / Motorcycle		1.85	$ 2.64
Passenger Car		1.85	$ 2.64
Delivery Van <17.5"		1.85	$ 2.64
Truck Tyres >17.5"		8.30	$ 11.83
Industrial <20.0"		2.45	$ 3.49
Agricultural Machinery <24"		4.20	$ 5.98
Agricultural Machinery >24"		8.30	$ 11.83
Forestry and Machinery < 300kg		12.60	$ 17.95
Forestry and Machinery > 300kg		61.10	$ 87.07
Retreaded Truck >17.5"		2.45	$ 3.49

Table 5-5
European Tire Levy Schedules continued

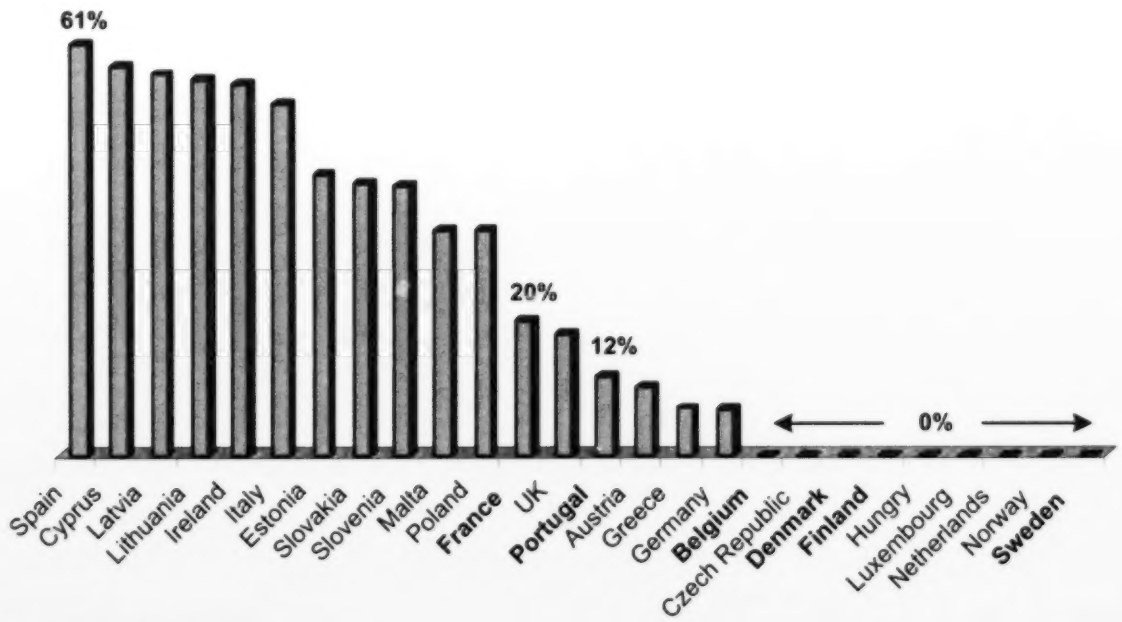
Tire Description	Jurisdiction / Value	
Portugal		
	€	$ CDN
Passenger Vehicle	0.80	$ 1.14
4x4 "on/off road"	1.79	$ 2.55
Commercial	1.44	$ 2.05
Pesado	7.18	$ 10.23
Agricultural (diverse)	1.71	$ 2.44
Agricultural (motor wheel)	8.82	$ 12.57
Industrial 8"-15"	3.10	$ 4.42
Maciço (Bulk)	3.72	$ 5.30
Civil Engineering <12.00-24"	7.14	$ 10.17
Civil Engineering >=12.00-24"	40.13	$ 57.18
Motorcycle >50 cc	0.56	$ 0.80
Motorcycle = 50 cc	0.11	$ 0.16
Aircraft	0.8	$ 1.14
France		
	€	$ CDN
Passenger Vehicle	2.00	$ 2.85
Truck	10.20	$ 14.53

Of the programs identified, none had a levy on passenger vehicle tires greater or equal to the $4.00 imposed in Alberta, yet all compensated for the increasing costs to manage larger commercial truck tires, and in four jurisdictions, levies were imposed on construction and engineering vehicles, commonly referred to as OTR tires. The levy for a construction tire greater than 29" in Sweden requires a levy of CDN$122.13.

Exhibit 5-20 illustrates that those jurisdictions imposing levies on tire sales have a reduced percentage of tires being landfilled as a percentage of scrap tires generated.

Of note is that France's industry managed program initiated its operations in 2004.

Exhibit 5-20
EU Percentage of Tires Landfilled as a Percentage of Tires Generated

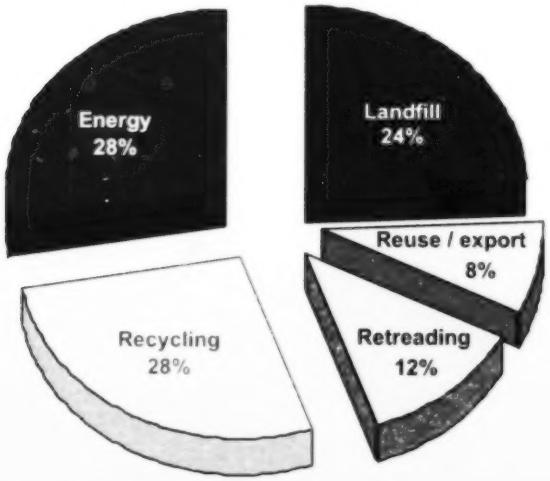


5.3.4 END-USE APPLICATIONS

In terms of ultimate disposition of scrap tire materials in Europe, the 25 member states of the E.U. reported that in 2003/04, approximately 76% of scrap tires approximately 2.94 million tonnes generated were commercialized, leaving an estimated 723,060 tonnes to be landfilled. Recycling markets in 2003/04 equalled TDF markets.

Exhibit 5-21 illustrates the end-use application of European scrap tires in 2003/04.

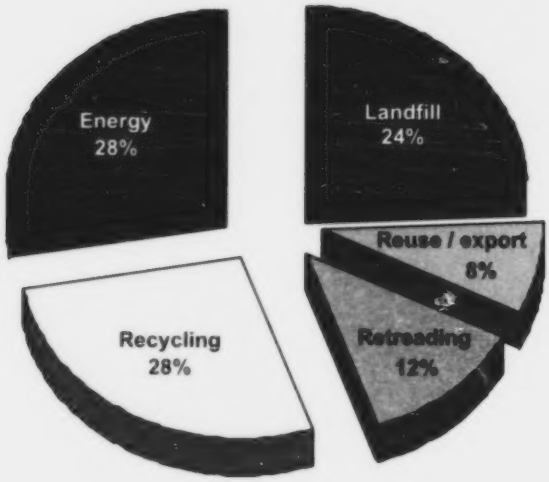
Exhibit 4-21
End-Use Application Distribution for E.U. Scrap Tires



Tracking actual state-by-state data for end-use applications is difficult as there is considerable movement of tires between jurisdictions to take advantage of processors having excess capacities. No current means for tracking the flow of tires exists, yet the ETRA presumes that one will eventually be developed.

Exhibit 5-21 illustrates the end-use application of European scrap tires in 2003/04.

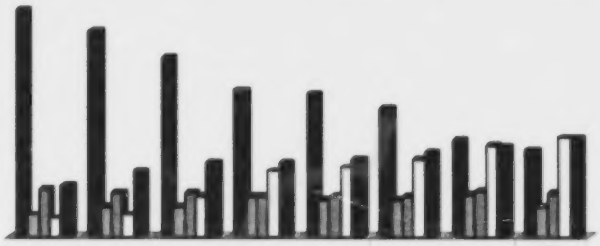
Exhibit 4-21
End-Use Application Distribution for E.U. Scrap Tires



Tracking actual state-by-state data for end-use applications is difficult as there is considerable movement of tires between jurisdictions to take advantage of processors having excess capacities. No current means for tracking the flow of tires exists, yet the ETRA presumes that one will eventually be developed.

Exhibit 5-22 demonstrates recent trends in scrap tire recycling across the E.U.—importantly the increased role of recycling end-use markets. Landfilling scrap tires continues to be widely used.

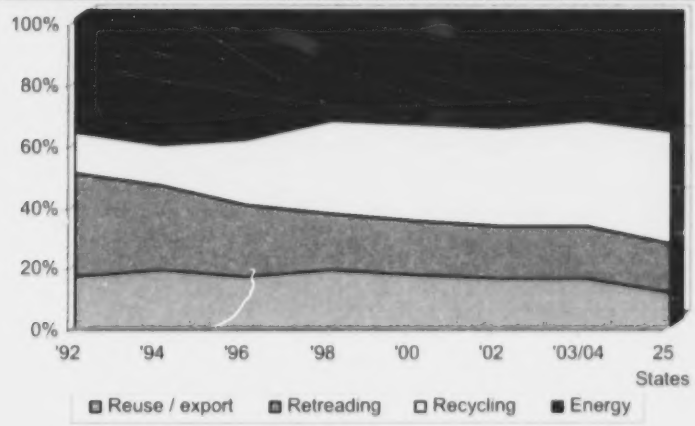
Exhibit 4-22
End-Use Application Distribution for E.U. Scrap Tires – 1992-04



	'92	'94	'96	'98	'00	'02	'03/04	25 States
Landfill	62%	56%	49%	40%	39%	35%	26.4%	23.8%
Reuse / export	6%	8%	8%	11%	10%	10%	11.4%	8.0%
Retreading	13%	12%	12%	11%	11%	11%	12.6%	12.0%
Recycling	5%	6%	11%	18%	19%	21%	25.0%	27.1%
Energy	14%	18%	20%	20%	21%	23%	24.4%	27.1%

Exhibit 5-23 illustrates the distribution of European end-use recycling markets from 1992-2004.

Exhibit 4-23
End-Use Distribution of E.U. Recycling Markets – 1992-04



Historically, Europe has made significant progress in reducing the amount of tires landfilled annually, cutting the figure to approximately a quarter of overall scrap tire end-uses. With the addition of ten new E.U. member states in May of 2004 recycling and TDF energy markets are strengthened.

5.4 GOVERNING STRUCTURE

Globally, numerous mechanisms and models exist for the management of used scrap tires. No two programs are identical, each tailoring program characteristics to best address issues within their particular jurisdiction, however many similarities do persist and are helpful in defining distinctive characteristics. The primary variables which exist within most recycling programs can be limited governance, recovery, and funding models.

- **Governmental Administrative Agency** – Typically programs being publicly administered are managed under the umbrella of an Environmental Ministry or equivalent department within the government. Stakeholder participation is limited to input and collaboration between relevant agents with no direct influence on the decision-making process from industry and the public.

- **Delegated Administrative Organization** – Administered at arm's length from the government, a delegated administrative organization (DAO) is given the authority to impose certain requirements on the agents within a recycling system. DAO's are unique in that they afford an opportunity for multi-stakeholder participation from sectors including, industry, government, and the public-at-large through appointments to the Board of Directors.

- **Producer Responsibility Organizations** – In some instances where legislation is enacted to require industry to meet certain recycling requirements without direct involvement on the part of the government, industry has organized itself collaboratively to best manage its obligations under the legislation. Decision making is taken in the best interest of the participant companies, who are compelled to meet their legislated duties.

Table 5-6 lists scrap tire recycling programs by governance model.

Table 4-6
Scrap Tire Program Governance Models

Governmental Administrative Agency	Delegated Administrative Organization	Producer Responsibility Organization
British Columbia	Alberta	Some European
Prince Edward Island	Saskatchewan	
Yukon	Manitoba	
U.S. States	Ontario (future)	
Some European	Quebec	
	Nova Scotia	
	Newfoundland	

5.5 RECOVERY MECHANISM

Jurisdictions typically regulate the manner in which scrap tires are recovered and collected from consumers, then transported to end-use processors. The basic recovery mechanisms, which are common across most programs, include the following:

- **Return-to-Retail:** When consumers purchase new tires, retailers will normally accept old tires and direct the scrap tire accordingly. Numerous variants of this model exist, with some retailers charging a fee to manage returned tires, while other jurisdictions ban the practice of imposing an additional fee. A few jurisdictions require retailers to accept scrap tires on a ratio of one-to-one for tires sold. This is the most widely employed method for recovering scrap tires.

- **Landfill On-site Diversion:** Consumers in many jurisdictions may return scrap tires to waste transfer stations or local landfills where they are separated from the solid waste mass and stored in a central location to be collected and later transported to end-use processors. Landfills either recover their costs through tipping fees for tires brought on site, or they may charge processors a fee to exploit the scrap tires for commercial use. In other programs, landfills are provided incentives so they may accept tires free of charge to consumers thereby promoting the recovery of scrap tires within the jurisdiction.

- **Certified Haulers:** Haulers are usually either contracted or registered, ensuring the responsible disposition of scrap tires within the system administered by the program. Haulers typically circulate to collect scrap tires from retailers or possibly other collection sites. Contract haulers operate in accordance to program regulations, while registered haulers at authorized to transport scrap tires in volume

5.6 PERFORMANCE

5.6.1 END-USE APPLICATIONS

Table 5-7 details end-use applications for scrap tires in Canadian programs.

Table 4-7
Canadian Scrap Tire End-Use Applications

Jurisdiction	Civil Eng. Applications & Shred	Rubber Crumb & Products	Tire-Derived Fuel (TDF)	Exported	Landfilled	Other
Alberta	60%	40%				
British Columbia		73%	27%			
Manitoba	41%	19%		40%		
New Brunswick		100%				
Newfoundland						100%
Nova Scotia		70%				30%
Ontario	6%	49%		30%	8%	6%
P.E.I.	12%			88%		
Quebec		76%	24%			
Saskatchewan	1%	63%		1%	32%	4%
Yukon				100%		

Often those scrap tires exported to American states from Ontario and Manitoba are used in TDF applications. Smaller jurisdictions often do not generate enough scrap tires to viably process them locally and either export their tires to be processed in neighbouring jurisdictions or collect them until a critical mass has accumulated to economically process them. Saskatchewan was the only program to report steel and fibre recovery as waste. Table 5-8 illustrates the end-use markets in U.S. States, as reported by the Rubber Manufacturers Association.

Table 5-8
US Scrap Tire End Use Applications

Jurisdiction	Civil Eng. Applications & Shred	Rubber Crumb & Products	Tire-Derived Fuel (TDF)	Exported	Landfilled	Other
Alabama	0.0%	0.0%	38.5%	0.0%	57.7%	3.8%
Alaska	0.0%	0.0%	0.0%	0.0%	0.0%	100.0%
Arizona	0.0%	100.0%	0.0%	0.0%	0.0%	0.0%
Arkansas	43.0%	0.0%	32.3%	0.0%	0.0%	24.7%
California	14.0%	21.1%	21.1%	14.0%	29.8%	0.0%
Colorado	35.3%	58.8%	0.0%	0.0%	0.0%	5.9%
Connecticut	0.0%	0.0%	83.3%	16.7%	0.0%	0.0%
Delaware	0.0%	0.0%	0.0%	0.0%	0.0%	100.0%
Florida	19.1%	31.8%	33.1%	6.4%	9.6%	0.0%
Georgia	12.4%	0.6%	87.0%	0.0%	0.0%	0.0%
Hawaii	20.0%	0.0%	80.0%	0.0%	0.0%	0.0%
Idaho	0.0%	0.0%	100.0%	0.0%	0.0%	0.0%
Illinois	10.1%	8.1%	81.8%	0.0%	0.0%	0.0%
Indiana	100.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Iowa	43.7%	3.2%	53.2%	0.0%	0.0%	0.0%
Kansas	0.0%	0.0%	21.7%	0.0%	60.9%	17.4%
Kentucky	40.0%	0.0%	40.0%	0.0%	0.0%	20.0%
Louisiana	30.0%	0.0%	70.0%	0.0%	0.0%	0.0%
Maine	22.2%	0.0%	77.8%	0.0%	0.0%	0.0%
Maryland	4.5%	10.6%	63.7%	21.2%	0.0%	0.0%
Massachusetts	0.0%	0.0%	0.0%	0.0%	0.0%	100.0%
Michigan	9.7%	0.0%	90.3%	0.0%	0.0%	0.0%
Minnesota	100.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Mississippi	0.0%	33.3%	66.7%	0.0%	0.0%	0.0%
Missouri	10.0%	10.0%	80.0%	0.0%	0.0%	0.0%
Montana	5.4%	0.0%	0.0%	0.0%	94.6%	0.0%
Nebraska	84.0%	0.0%	0.0%	0.0%	0.0%	16.0%
Nevada	0.0%	0.0%	0.0%	0.0%	100.0%	0.0%
New Hampshire	0.0%	0.0%	0.0%	0.0%	0.0%	100.0%
New Jersey	0.0%	100.0%	0.0%	0.0%	0.0%	0.0%
New Mexico	0.0%	0.0%	0.0%	0.0%	0.0%	100.0%
New York	82.2%	13.7%	0.0%	0.0%	0.0%	4.1%
North Carolina	31.6%	36.8%	31.6%	0.0%	0.0%	0.0%

Table 5-8
US Scrap Tire End Use Applications continued

Jurisdiction	Civil Eng. Applications & Shred	Rubber Crumb & Products	Tire-Derived Fuel (TDF)	Exported	Landfilled	Other
North Dakota	0.0%	0.0%	0.0%	0.0%	0.0%	100.0%
Ohio	94.1%	0.0%	0.0%	0.0%	0.0%	5.9%
Oklahoma	26.9%	0.9%	72.2%	0.0%	0.0%	0.0%
Oregon	9.6%	30.4%	8.3%	0.0%	48.3%	3.4%
Pennsylvania	3.9%	2.0%	92.5%	0.0%	1.7%	0.0%
Rhode Island	0.0%	100.0%	0.0%	0.0%	0.0%	0.0%
South Carolina	23.4%	0.6%	75.9%	0.0%	0.0%	0.0%
South Dakota	0.0%	0.0%	100.0%	0.0%	0.0%	0.0%
Tennessee	25.0%	0.0%	54.2%	0.0%	20.8%	0.0%
Texas	14.6%	0.0%	79.8%	0.0%	0.0%	5.5%
Utah	52.6%	0.0%	47.4%	0.0%	0.0%	0.0%
Vermont	0.0%	0.0%	0.0%	0.0%	0.0%	100.0%
Virginia	77.8%	2.6%	19.6%	0.0%	0.0%	0.0%
Washington	9.3%	1.9%	5.2%	0.0%	74.3%	9.3%
West Virginia	0.0%	0.0%	0.0%	0.0%	100.0%	0.0%
Wisconsin	0.0%	0.0%	100.0%	0.0%	0.0%	0.0%
Wyoming	0.0%	0.0%	0.0%	0.0%	100.0%	0.0%

Significant flow between states in America exists—tracking these flows is not possible without a reporting mechanism. Often this flow occurs to meet the demand for fuel supply in facilities using scrap tires for TDF. Table 5-9 illustrates the end-use markets in E.U. States, as reported by the European Tyre Recycling Association.

Table 5-9
European Scrap Tire End Use Applications

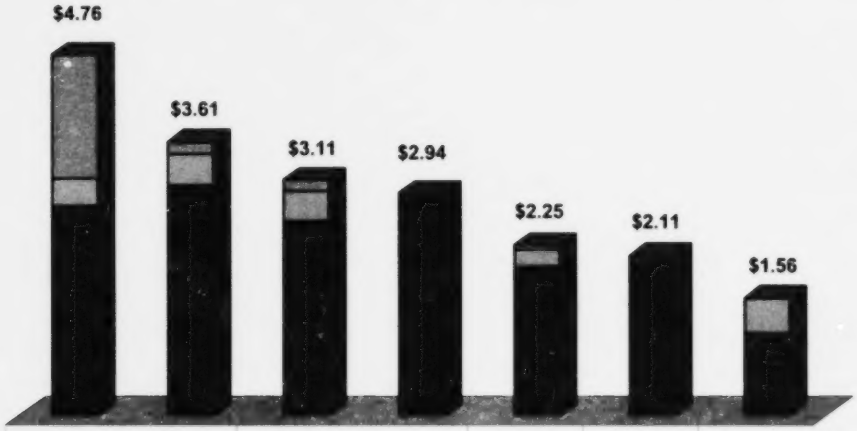
Jurisdiction	Scrap Tires Generated	Reuse/export	Retreading	Misc.	Landfill
Austria	6,097,561	0%	5%	0%	10%
Belgium	8,780,488	10%	5%	9%	0%
Cyprus	634,146	0%	0%	0%	58%
Czech Republic	5,731,707	0%	18%	0%	0%
Denmark	4,986,098	49%	5%	0%	0%
Estonia	280,488	0%	0%	0%	42%
Finland	4,796,341	0%	4%	0%	0%
France	47,560,976	10%	14%	0%	20%
Germany	70,975,610	10%	11%	0%	7%
Greece	6,829,268	2%	9%	0%	7%
Hungry	6,097,561	14%	4%	0%	0%
Ireland	3,902,439	0%	5%	30%	55%
Italy	47,073,171	2%	14%	0%	52%
Latvia	1,295,366	0%	10%	0%	56%
Lithuania	5,487,805	0%	0%	0%	56%
Luxembourg	522,439	100%	0%	0%	0%
Malta	365,854	33%	0%	0%	33%
Netherlands	8,231,707	20%	10%	0%	0%
Norway	4,268,293	6%	5%	0%	0%
Poland	10,975,610	12%	20%	0%	33%
Portugal	8,341,463	0%	27%	0%	12%
Slovenia	609,756	0%	0%	0%	40%
Slovakia	6,071,220	0%	14%	0%	40%
Spain	36,302,805	4%	14%	0%	61%
Sweden	8,780,488	14%	4%	0%	0%
UK	54,146,341	9%	12%	0%	18%
Total (PTE)	**359,145,000**	**28,596,220**	**42,786,951**	**1,941,463**	**85,647,073**
% of Total		**7.96%**	**11.91%**	**0.54%**	**23.85%**

Flow between states is not monitored, yet it is estimated that overall 24% of tires are landfilled, 8% are reused or exported, 12% are retreaded, 27% are recycled, and 27% are consumed in TDF applications.

5.6.2 FINANCIAL PERFORMANCE

Canadian jurisdictions are typically similar in that they provide financial incentives to processors to recycle scrap tires. A detailed analysis of Canadian programs with available financial data is illustrated in Exhibit 5-24.

Exhibit 5-24
Canadian Scrap Tire Recycling Programs – Gross Cost per PTE Recovered



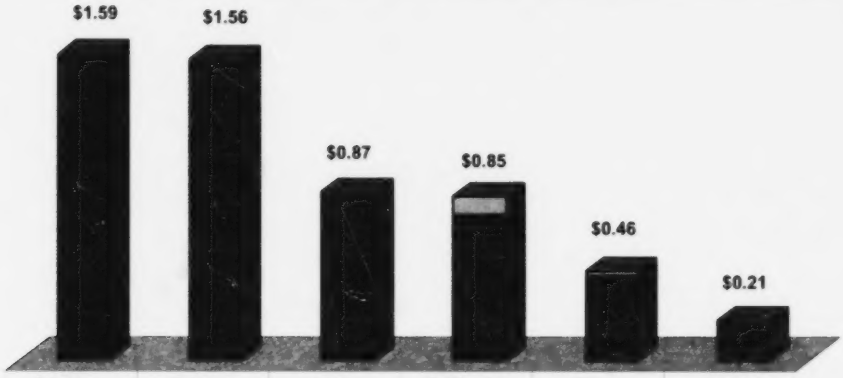
	Alberta	New Brunswick	Sask.	P.E.I.	Manitoba	British Columbia	Newfound-land
System Development & Advertising	$1.63	$0.16	$0.15	$-	$0.05	$-	$0.00
Program Administration	$0.36	$0.41	$0.38	$-	$0.21	$0.05	$0.44
Processing and Transportation	$2.78	$3.04	$2.58	$2.94	$1.98	$2.07	$1.11

Processing and transportation costs to Canadian scrap tire programs are similar, ranging from approximately two to three dollars per PTE recovered. Newfoundland's program is less expensive because it is starting up its program and is not currently processing tires, but rather collecting them. Program administration costs are reasonably standard across programs, ranging from 21 cents to 44 cents—with the exception of British Columbia. Alberta is the sole province contributing significantly to system development and advertising. The other six jurisdictions combined to invest $475,000 in this domain, when Alberta expended over $6.75 million.

American programs typically expend less than Canadian programs, due primarily to the limited funds at their disposal from having lower levy values and secondly because programs encourage free market management of scrap tires. Furthermore, many states require regulatory transfers from collected levies that are essentially escheated to fund other programs. Many states require owners of stockpiles to fund site abatement—often leading to increased enforcement and legal expenses.

Exhibit 5-25 illustrates a sample of program costs per PTE collected in Canadian funds.

Exhibit 5-25
American Scrap Tire Recycling Programs – Gross Cost per PTE Recovered



	Arkansas	Arizona	Utah	California	Illinois	Florida
Advertising & System Development	$-	$-	$-	$0.09	$0.02	$-
Processing, Transportation,and General Costs	$1.59	$1.56	$0.87	$0.76	$0.44	$0.21

The focus in American programs tends to be focused on stockpile abatement, enforcement, permitting, and site remediation activities. Otherwise, the flow of scrap tires is normally left to the demand of the marketplace.

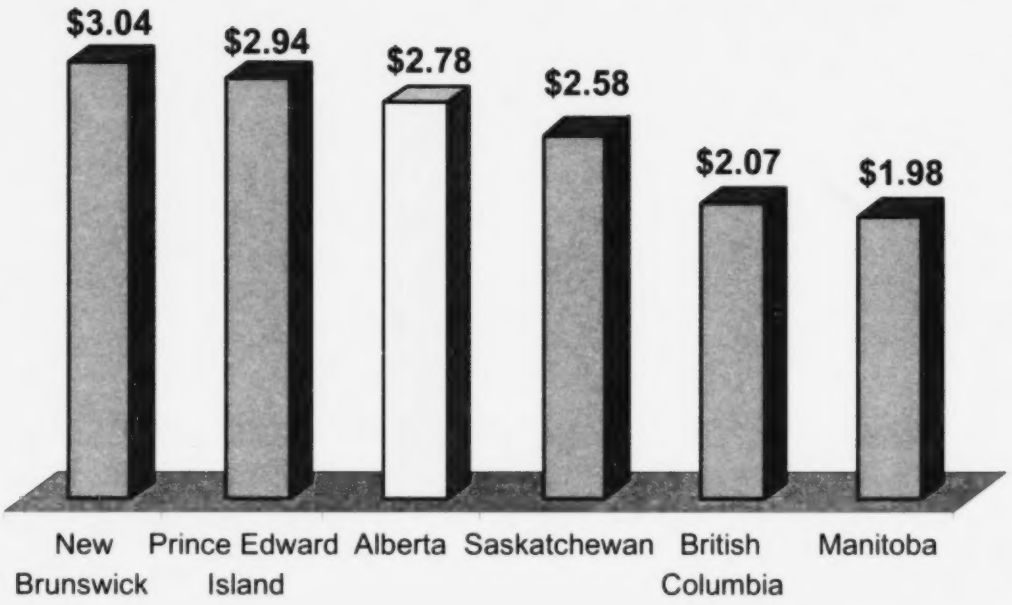
* * *

Scope limitations of this study made financial benchmarking of all American and any European nations unfeasible.

5.7 INCENTIVE ANALYSIS

Of those Canadian jurisdictions reporting complete program costs in the domain of incentive payments made to transporters and processors Exhibit 5-26 details the average price paid out per PTE collected.

Exhibit 5-26
Recycling Support Paid by Canadian Programs



At the low end of the spectrum, British Columbia and Manitoba support TDF applications within their programs. Based on this data, programs that used scrap tires as a fuel realized savings of up to $1.00 than those that did not.

Table 5-9 details current incentive schedules for some Canadian jurisdictions.

Table 4-9
Canadian Incentive Support Schedules

Incentive Rates by Jurisdiction	
Alberta	**British Columbia**
Transportation - $50-$100 per tonne Processing - Shred - $100-$195 / tonne Crumb - $110 / tonne of shred Product - $100 / tonne of crumb	Transportation - $0.116 - $0.368 / tonne / km Processing - Shred - $69-$140 / tonne Crumb - $210 / tonne TDF - Shred - $127 Tires - $98
Saskatchewan	**Manitoba**
Processing - $60-$335 / tonne	Municipal Diversion - $0.50 / tire Processing - Shred 4 inch - $152.44 / tonne Shred 2 inch - $182.93 / tonne Crumb - $219.51 / tonne Moulded Products - $304.88 / tonne Tire Sidewalls - 152.44 / tonne Die Cut - $243.90 / tonne Blast Mats - $274.39 / tonne TFD (USA) - $243.90 / tonne
Quebec	
Blasting Mats - $70 / tonne Crumb - $100 / tonne Manufactured Products - $35 / tonne TDF - $45 / tonne Retread - $1 / tire	

Incentive schedules are being drafted in Ontario as that program attempts to establish itself in the near future. Discussions to date have suggested an incentive structure that would include funding for transportation, processing, and TDF.

Seven U.S. states have implemented end-use subsidy programs, six of which are detailed below. Details for the seventh state, Iowa, were not available. Table 5-10 describes the funding schedules applied.

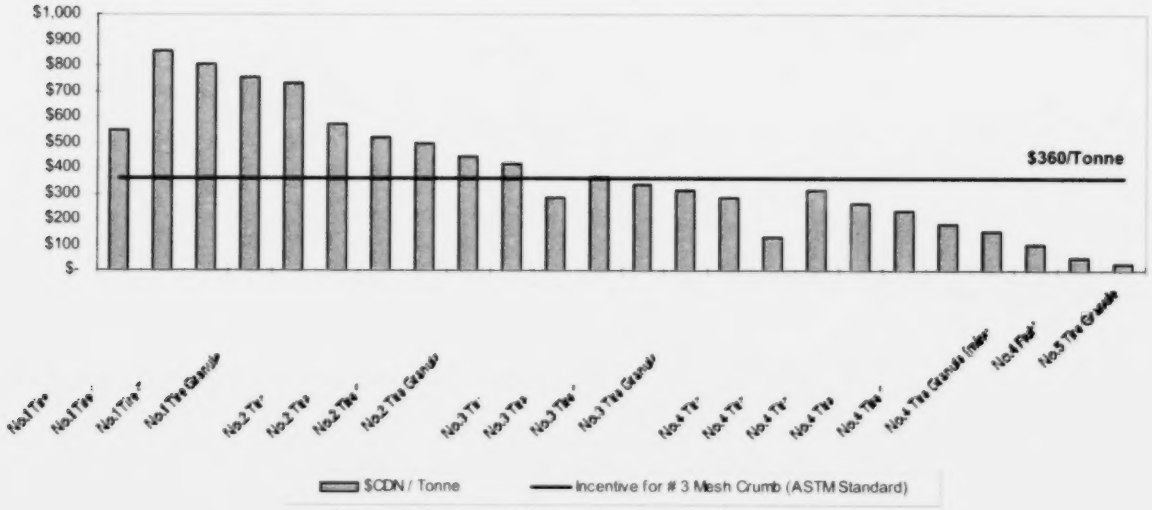
Table 5-10
US Incentive Support Schedules

Incentive Rates by Jurisdiction	
Louisiana	**Utah**
$0.85 / 20 lbs - shred $0.15 / 20lbs - raw product / fuel	$75 / ton of crumb $65 / ton other recycling $50 / ton beneficial use
Virginia	**Oklahoma**
$50 / ton - any use from stockpile $22.50 / ton - any use for used tires	$0.50 / tire if 25% of tires are from illegal dump $0.35 / tire if processor provides regular pickup & transportation from all counties
Nebraska	**Colorado**
$20 / ton – up to $20 cost sharing for Civ E, manufacturing 25% - Reimbursement for tire-derived products 50% - Reimbursement for crumb rubber products	$50 / ton - any use

In Virginia, incentives paid out through the program follow wherever it is eventually commercialized. This is consistent with the fact that scrap tires have attained commodity status in recycling markets, and the flow of tires travels to markets in accordance with consumer demand.

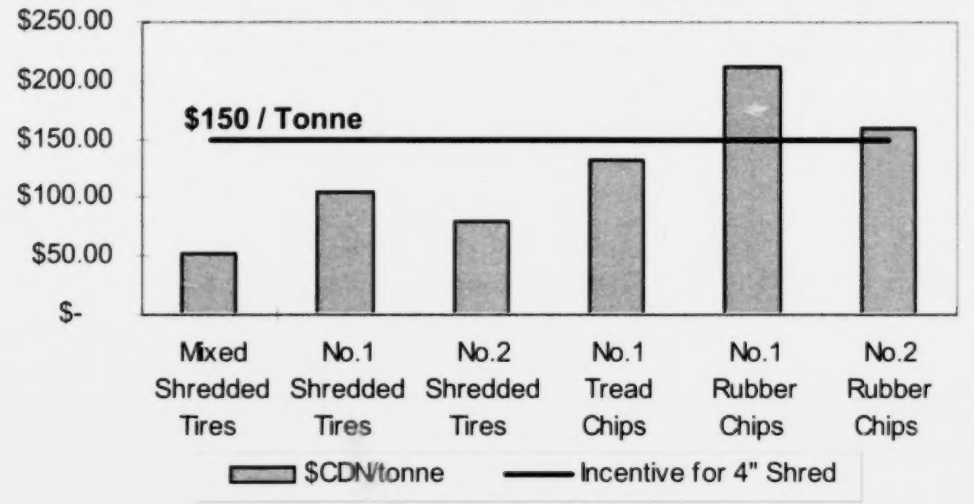
Exhibits 5-27 and 5-28 show the current commodity prices of crumb rubber and rubber shred materials. Each shows the normal level of subsidization for each product category, $360 per tonne of rubber crumb (transportation, shred, and crumb incentive) and $150 per tonne of crumb (transportation and shred incentive).

Exhibit 5-27
Commodity Prices for Crumb Rubber Compared to Albertan Incentive Rate



Tire granulated markets in North America fluctuate in accordance to global supply and demand. Processors' profitability will increase as resale values increase, and when prices decrease, rubber crumb becomes less economical, and processors will prefer to simply shred tires.

Exhibit 5-28
Commodity Prices for Tire Shred Compared to Albertan Incentive Rate



Tire shred markets are typically supported by TDF applications and the demand for scrap tires as fuel. When used in other applications such as civil engineering projects, tire shred is no more economical than rock aggregate, and the market is typically artificially created in order to utilize shredded tires—the state of New York, for example, processes stockpiled tires, but the Department of Transportation must use the shred for road beds to ensure adequate end-use markets for the excess supply created.

Scrap Tire Recycling and Research and Development

Identifying and commercializing viable scrap tire processing technologies is a goal undertaken in some programs, while others cannot afford to contribute the significant investment dollars necessary to uncover more economical means for recycling scrap tires. Efforts by the tire manufacturing industry since the introduction of the rubber tire have been to ensure tire durability, and for all intents and purposes they are indestructible. Modern tires are treated with sulphur at high temperatures (vulcanized) to strengthen the rubber, and further supported by steel wire, making actual scrap tire recycling (producing new tires from old tires) all but impossible. Only a small fraction of rubber content in new tires can currently be comprised of powdered materials from scrap tires (5-15%). Therefore much research has been focused on uncovering more beneficial methods for treating scrap tires.

- Rubber crumb is used widely in asphalt applications worldwide. Much research has been devoted to this domain and suggests that significant savings can be incurred in reduced highway maintenance lifecycle costs due to its flexible characteristics. Other research conducted in Europe and Scandinavia has indicated that rubber-modified asphalt also reduces overall noise pollution.

- Pour-in-place applications have been studied at length and are popular substitutes in playground and athletic surfaces. Studies suggest that rubberized playground surfaces have lower-impacts on children falling than traditional sand surfaces. Instances have been observed where accelerants have been used to trigger fires on these types of end-uses.

- Cryogenic processes have been employed to process scrap tires, which become embrittled in temperatures lower than -80°F. Using super-cooling technologies, including the use of liquid nitrogen, rubber particles can be broken down to small sizes and even powdered.

- Devulcanization allows for vulcanized scrap tires to be reprocessed so that the sulphur bonds strengthening the rubber are deteriorated to the point where the rubber can be reused similar to virgin materials. To date devulcanization has not proven to be cost-effective, yet promising new advances in the domain trigger new optimism that scrap tires can be recycled into new tires in the future.

- Another such alternative is pyrolysis—the production of gaseous fuels by heating materials containing organic matter in the absence of oxygen. The process generates fuels (carbon, oil, gas, steel) that can be collected and used in later applications. Though not a proven technology, the practice is employed in Europe and Japan on limited scale projects. Actual economic data for pyrolysis projects is lacking in the domain, but they are not considered to be significantly more cost-effective than conventional methods.

Other research has been done in many other domains, and until a truly economical end-use market and process are identified, this will likely continue to be the case.

5.8 KEY QUESTIONS

5.8.1 QUESTION ONE—PROGRAM EFFECTIVENESS

How does the overall effectiveness of Alberta's programs in terms of achieving mandated outcomes (material collection rates, etc) compare with programs targeting those same materials in other jurisdictions?

Alberta—World Leaders in Responsible Tire Recycling

Alberta's tire recycling program is a global leader in recycling scrap tires in an environmentally responsible manner, with no tires being landfilled or consumed for tire-derived fuel (TDF). Furthermore, it has safely abated all major stockpiles and converted a large percentage of processed tires into value-added products to be used in numerous end-use applications.

Investing in Research and Market Development

Alberta is the leader in research and market development funding of benchmarked programs—it finances more dollars per PTE recovered than any other program. It continues to invest in future end-use applications, including rubber-modified asphalt in cold climates, and effective management of large OTR tires.

On-road Vehicle Tires Effectively Managed

Passenger, light truck and commercial truck tires fall within the scope of the current program; a scope that aligns with the majority of North American and European programs.

Off-road Tires Outside Current Scope

TRA provides supplemental incentive support to OTR processors, but has yet to fully incorporate them within the program. Scandinavian programs and some other E.U. programs include OTRs within their programs, a trend not currently established in North America, with very few programs including these tires.

5.8.2 QUESTION TWO—FINANCIAL COSTS

How are the financial costs attributable to achieving mandated outcomes of Alberta's programs and how does this compare (on a cost-effectiveness basis) with the programs in other jurisdictions?

Highest Cost Program Benchmarked

The program administered in Alberta is the most costly of all programs benchmarked. This is driven largely by the extensive research and market development funding that the program has recently undertaken. A second cost driver in the program is the government's policy not to use tires for TDF, which elevates the costs within the incentive program. These two drivers are both a matter of public policy.

Investors in Research and Development

TRA has invested heavily in research and market development over the past two years thanks to its strong financial position from accumulated ADS surpluses. No other jurisdiction is comparable in terms of funding for this type of program on a per PTE basis.

At the current rate of funding, the program will have exhausted its reserves within the coming four to six years and, without additional support, the program will have to be scaled back.

Comparable Incentive Program

The cost of Alberta's scrap tire recycling incentive program is comparable to most other jurisdictions offering incentives and financial support to promote end-use markets. The extensive program, and strong financial base, allow for effective provincial scrap tire recycling alternatives.

Alberta government policy disallows scrap tires to be used in energy recovery, when the majority of other programs commercialize scrap tires through tire-derived fuel applications—a practice which eliminates the most economic application of scrap tires, thus increasing the total cost to the program.

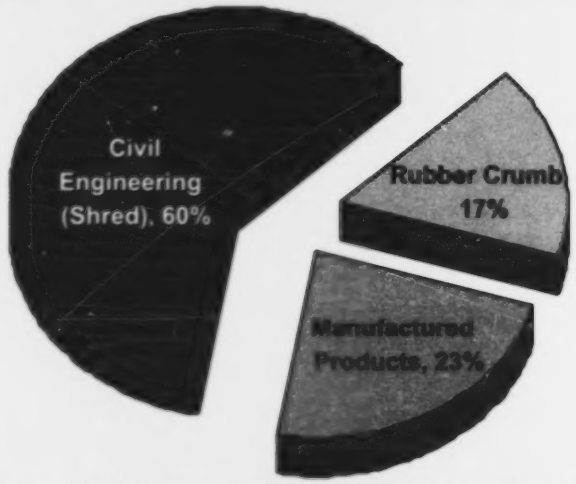
5.8.3 QUESTION THREE—DISPOSITION OF RECYCLED MATERIALS

How do the Alberta programs compare with programs in other jurisdictions in terms of the disposition of collected materials (i.e. volumes and/or rates of collected materials that are re-used and recycled)?

Value-added Products Recycling

Annual volumes of scrap tires in Alberta appear to be completely mitigated through value-added end-use applications—no tires are stockpiled, landfilled, or used for TDF. The program generates large quantities of value-added products that can be used in beneficial end-use applications. Exhibit 5-29 illustrates how scrap tires are treated in Alberta.

Exhibit 4-29
Alberta End-Use Distribution – 2004



Around the world, stockpiling and landfilling scrap tires are prominent scrap tire management issues, and without the necessary supporting legislative framework and economically viable end-use markets, this will likely continue to be the case in these jurisdictions. In 2003, a total of 130 million tires were consumed in TDF applications in the U.S. and a further 98 million PTEs (0.8 million tonnes) were used as fuel in the E.U. during 2003/04. TDF markets continue to be the most profitable markets for scrap tires around the world.

Challenges in OTR Disposition

Managing OTRs continues to be an issue nation-wide, with economically viable alternatives non-existent. Alberta is currently exploring OTR processing options with one processor operating on a limited scale in the north. Most Canadian programs export these tires to the U.S. to be managed abroad.

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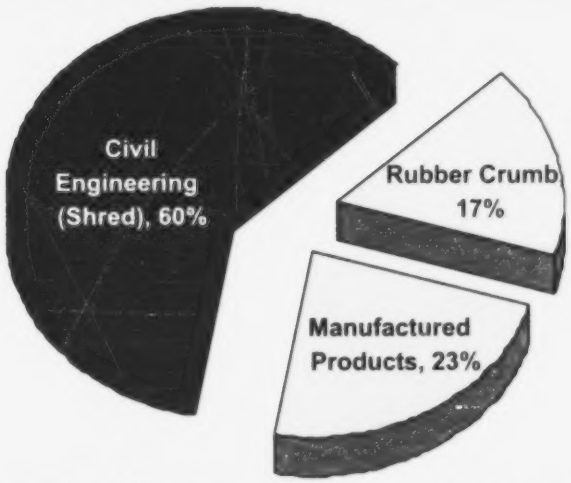

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5.8.4 QUESTION FOUR—APPROPRIATE AND EFFECTIVE MECHANISMS IN ALBERTA

Are the most appropriate and efficient mechanisms being employed to achieve program objectives in Alberta?

Opportunity to Expand

Two opportunities exist to expand the scrap tire program in Alberta:

- **Off-the-Road (OTR) Tires**—Alberta does not charge ADS levies on OTR tires. The inclusion of OTRs within programs is common in European programs. Incorporating structured levy schedules will be necessary to ensure sufficient resources are available to support viable OTR recycling operations. Challenges exist in the recycling of OTR tires in Alberta, particularly logistical issues arising from the transportation of these voluminous materials from isolated regions. In the case of OTR tires, industrial user participation will be essential in developing a successful program.

- **Retreaded Tires**—Retreaded tires currently fall outside of the scope of Alberta's program. Retreaded tires neither collect ADS, nor do they receive incentive funding to support retreading operations. European jurisdictions are particularly comfortable in charging levies, albeit reduced, on retreaded tires. The program in Quebec provides a $1.00 incentive to retreading operations per tire it processes.

Expanding the program to include OTRs is a logical progression for the program in Alberta. An example of a program successfully including OTRs is Finland which charges an additional levy on these tires to fund for tire shredding for civil engineering applications or energy recovery. Including retreaded tires represents a lesser opportunity as it is currently a self-sustaining industry and end-of-life retreaded tires only affect scrap tire markets to the same magnitude as those sold onto the market.

Second Generation Recycling Options

Recycling scrap tires in Alberta has been successful to date, in that value-added products have been created to extend the useful life of scrap tire materials. These synthetic rubber products also have limited lifecycles, and once they have run their course, viable recycling alternatives should be made available for these same materials. If not, scrap tire recycling is not waste diversion, but rather short-term waste avoidance, having the same result in the long term as if materials recycling had never occurred. Ensuring closed-loop recycling alternatives for second generation end-use applications should be considered, along with primary scrap tire recycling, in a jurisdiction wide waste management strategy.

Scrap Tires as Fuel

Benchmarking has shown that the most widely used application for scrap tires is as a commodity is for tire-derived fuel. Alberta, as a matter of public policy, has opposed this alternative, thereby impacting program economics. This decision could be revisited to ensure the benefit realized through emission controls is greater than the cost to support end-use markets.

As fuel prices rise, the value of scrap tires will continue to rise accordingly, reflecting the increased demand for low-cost fuel sources. Scrap tires, as a fuel will likely become increasingly profitable in the future. Appendix F describes historical energy prices in relation to rubber.

Updating ADS Levies

The $4.00 Advanced Disposal Surcharge imposed on the retail sales of new on-road vehicle tires does not account for the increasing cost of scrap tire processing for larger tires. Commercial truck tires are often five times greater in size than traditional passenger vehicle tires. The program should have a good idea of what costs are incurred to recycle different tires and could adjust ADS levels to reflect those costs. Such a revision could also incorporate structured rates to include OTR tires or floating rates that could be adjusted annually to reflect to continuously changing cost to recycle scrap tires.

Further Investment in Research Programs

The potential exists with a successful development program to improve the overall economics of the program, or improve the effectiveness of the provincial tire recycling program. The current processor incentive regime established in the province is costly, yet should a viable alternate market be discovered it is reasonable to presume that scrap tires will be increasingly commoditized. For example, should devulcanization processes generate virgin rubber from scrap tires in a cost-effective manner, thereby becoming a source of inexpensive materials for tire manufacturers, scrap tires would readily collected by brandowners to benefit their financial performance.

The success of the R&D initiatives remains to be seen, and research in other jurisdictions has yet to uncover any alternative applications for scrap tires.

Collaboration between common stakeholders would be the most advantageous avenue to pursue research development in this domain, leveraging knowledge and resources between brandowners and various stakeholders. Economies can be realized through joint activities, as discoveries in this domain require considerable investment, that no one jurisdiction can reasonably be expected to incur by itself. Programs are better positioned to allocate development funds to program-specific needs. Agents who stand to gain from the commercialization of future technologies; particularly brandowners and government should be responsible for administering research initiatives.

Stewardship in the Scrap Tire Recycling Program

Extended producer responsibility within the scrap tire recycling program in Alberta is limited. Brandowners, through retailers, need only comply with remitting ADS levies to TRA, and once a tire has been sold, responsibility no longer resides with brandowners to recover scrap tires. Brandowners are represented on the ARMA Board of Directors, but no organization has been established to manage post-consumer tires. An example in industry where this has occurred is in beverage container recycling where the Alberta Beverage Container Recycling Corporation (ABCRC) has been created by brandowners to provide a recycling medium for designated materials.

If a market driven model for tire recycling is preferred over an industry-led model, the current incentive regime should subsist, and incentives should be adjusted to match appropriate materials market levels. Greater levels of participation and organization will be required by brandowners if an industry-led model is preferred in Alberta. Limited scrap tire generation in Alberta makes industry-coordinated operations less agreeable for that proponent, and for this reason, the market driven approach will likely continue to be the most viable approach in the province.

QUESTION FIVE—LEADING PRACTICES

Are there examples of best practices or innovative approach to waste stewardship that can be identified from this analysis that would be appropriate for consideration in Alberta?

Programs identified as incorporating leading practices within their program are described below. These topics are discussed in further detail within this study.

- Scandinavian countries are viewed as innovators and leaders in environmental stewardship, yet these nations are not averse to consuming scrap tires in TDF applications. Approximately 48% of Sweden's tires are used in TDF, Finland uses TDF as a secondary alternative with preference given to value-added materials, and Norway burns 34% of its scrap tires for energy recovery.

- Off-the-road tires (OTRs) are difficult and costly to recycle. Some European programs and Saskatchewan charge higher levies to offset the additional transportation and processing costs incurred while managing OTRs.

6 WASTE ELECTRONICS

6 WASTE ELECTRONICS

Rapid technological advancement combined with reduced product life cycles is creating a global proliferation of electronic products. Despite the drive towards miniaturization, the overall tonnage of electronics manufactured and sold throughout the world is ever increasing.

The resulting waste streams are creating issues both locally in Alberta and across the world. Scrap electronics consist primarily of metal and plastic; with much smaller amounts of glass, rubber, and a host of other materials including many toxins such as lead, mercury and freon. Metals and plastics comprise approximately 12% of the current total waste stream in Alberta. Scrap electronics contribute to a portion of this tonnage, and the associated toxins create a significant environmental stewardship concern.

The vast majority of scrap products in the electronics waste stream can be recycled and have value as a recycled commodity. The barrier to recycling such products is the cost and logistics of collection, transportation and processing of the materials. This is a particularly salient issue in places such as Alberta with such a large area and low population density. Recycling scrap electronics, with some exceptions in urban areas, is largely economically unfeasible without the support of a formal recycling program.

There are few regulated electronics recycling programs currently operating. There are only two other provincial programs besides Alberta's in North America; the remainder being Europe and Asia. Most other North American jurisdictions deal with electronics on a project basis (e.g. annual round-ups, etc) with larger metal-centric goods (e.g. appliances) being recycled haphazardly based on geography and current commodity prices.

Europe has established the Waste Electrical and Electronic Equipment (WEEE) directive, mandating all EU members to implement an electrical product recycling program by August 2005. It appears that only six of the 25 EU members have actually implemented an electronic recycling program before the WEEE Directive was passed, with the balance of the programs still under development or in the implementation stage.

6.1 ALBERTA WASTE ELECTRONICS PROGRAM

Governance

Alberta Recycling Management Authority (ARMA) is a not-for-profit association responsible for managing Alberta's tire (TRA) and electronics recycling (ERA) programs. ERA within ARMA operates as a Delegated Administrative Organization (DAO) in order to facilitate administration that is governed by a multi-stakeholder board to oversee logistics and financing of the electronic recycling program in the province of Alberta. The mission of ARMA is to be

> *"...a sustainable Alberta recycling solution for designated materials that is a model of excellence, environmentally and socially responsible, and economically viable."*

The Environmental Protection Act, Electronics Designation Regulation[1] has identified "electronics" as the following but not limited to:

- Televisions,
- Computers, laptops and notebooks, including CPU's, keyboards, mouse, cables, and other components in the computer,
- Computer Monitors,
- Computer Printers, including printers that have scanning or fax capabilities, or both,
- Scanners,
- Audio and Video playback and recording systems,
- Telephones and fax machines,
- Cell phones and other wireless devices, and
- Electronic game equipment,
- Excludes electronics contained within and affixed to a motor vehicle.

ERA has incorporated only a portion of those products identified in the legislation into the initial ERA program. Televisions, computers and accessories, computer monitors, and computer printers are included in the initial program scope. Cell phones, audio and video playback equipment, scanners and electronic game equipment have been excluded to date. White goods and other appliances found principally in European programs are excluded from the Alberta regulation.

Financing

The Electronics Designation Regulation has structured the recycling program to charge an initial Advanced Disposal Surcharge (ADS) to end-users at the time of purchase on designated electronic products as an end-of-life disposal fee. The ADS is a visible, fixed fee, that is charged on a per-unit basis to consumers and is collected in trust by retailers and either remitted directly to ERA or remitted through the supply chain to other registered suppliers, distributors or manufacturers. A summary of products and the ADS is included as Appendix H. These products can then be discarded in Alberta by consumers, free of charge, at participating electronic collection sites. Retailers or other organizations that accept waste electronics do so under their own business policy as there is no mandatory retail take-back regulation.

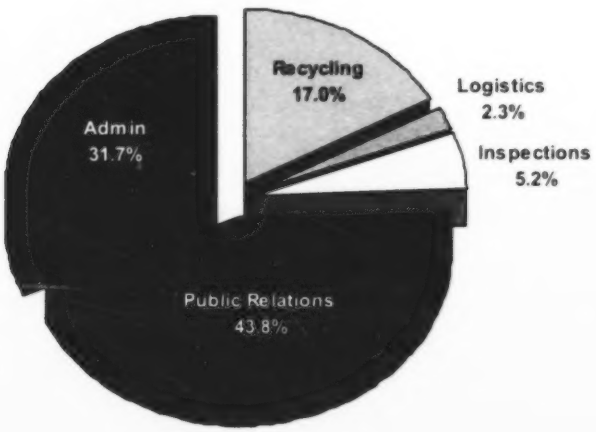
Participation in this program is mandatory, all manufacturers, retailers, distributors, or wholesalers who sell applicable products into or within the province must register with ERA and comply with all legislation and bylaws. All registrants under the program must self-report the ADS collected and remit to ERA, registrants are also subject to a compliance review process, whether it be at random or at the discretion of ERA, to ensure accuracy of the reporting methods and practices used to calculate and remit the ADS. The ADS revenue is then applied to collection, recycling, administration and other program costs. There is no leakage of funds from ERA to TRA or any other government agency or program.

[1] http://gov.ab.ca/home/Orders_in_Counci/2004/504/2004_213.html

Collection and Processing

Processors are paid $700 per tonne for processing and $50 - $200 per tonne for transportation while electronic collection sites are remunerated $50 per tonne for collection. This approach has facilitated a commodity environment for the waste electronics as processors are able to compete for the disposed equipment as legislation has created a competitive market for the transportation, collection and processing of the waste electronics. Revenue generated from the collection, transportation and sale of recycled materials is retained by each organization and not remunerated to ERA. A breakdown of program costs by category is illustrated in Exhibit 6-1.[2] As ERA is in the initial year of the program, and has incurred program delivery costs due to program start-up and implementation. The majority European electronic recycling schemes allocate 80-95% of their funds towards collection, transportation and processing. Strict guidelines under the Incentive Program for Processors and Transporters describe that waste material cannot be shipped abroad with incentive recipients subject to compliance audits.

Exhibit 6-1
ERA Program Cost Structure

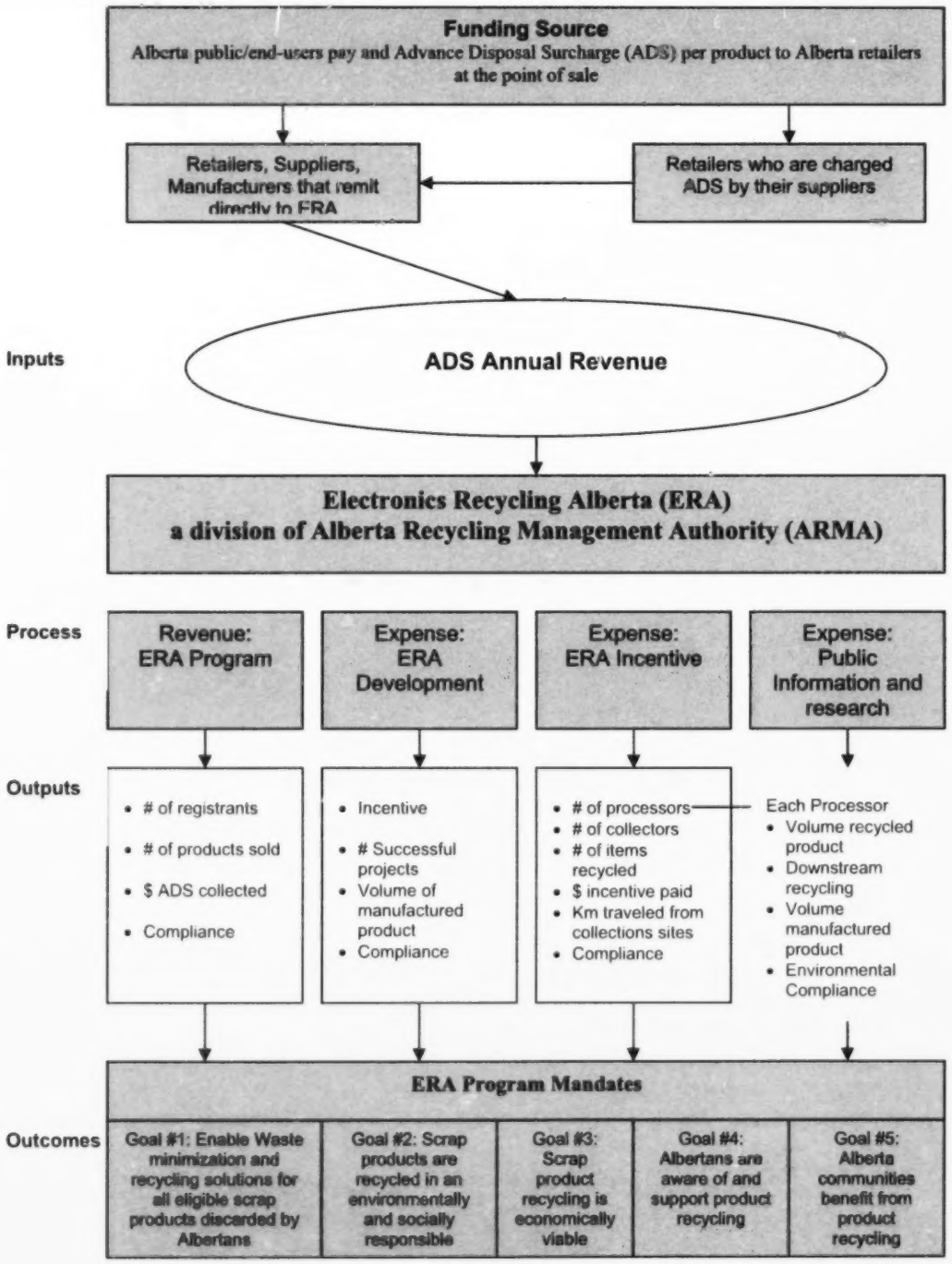


One of the critical starting points in benchmarking evaluations is the program logic model. The model relates inputs to process or activities, which, in turn produce outputs (statistical measures of volume) that lead to outcomes. The purpose of the logic model is as a framework to conceptually understand and document the program as a basis to answer the five key questions and to use it to frame our benchmarking evaluation methodology, subsequent interview protocols and analysis methodology.

The program logic model for ARMA's ERA Program is illustrated in Exhibit 6-2. This exhibit highlights the multidimensional attributes of our program review methodology.

[2] Inspections is a cost category used by European programs. This category includes environmental compliance through processor audits as well as other external audits.

Exhibit 6-2
ARMA/ERA Logic Model



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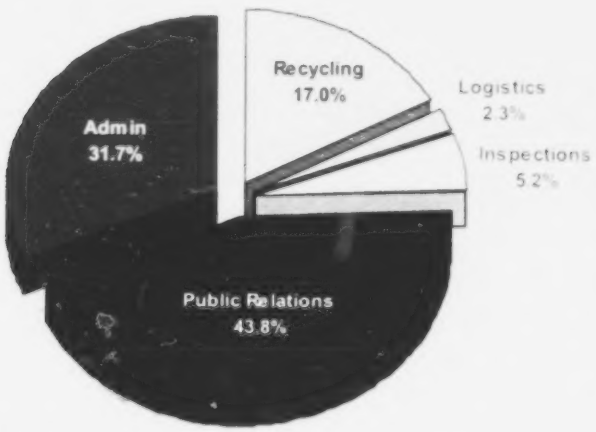

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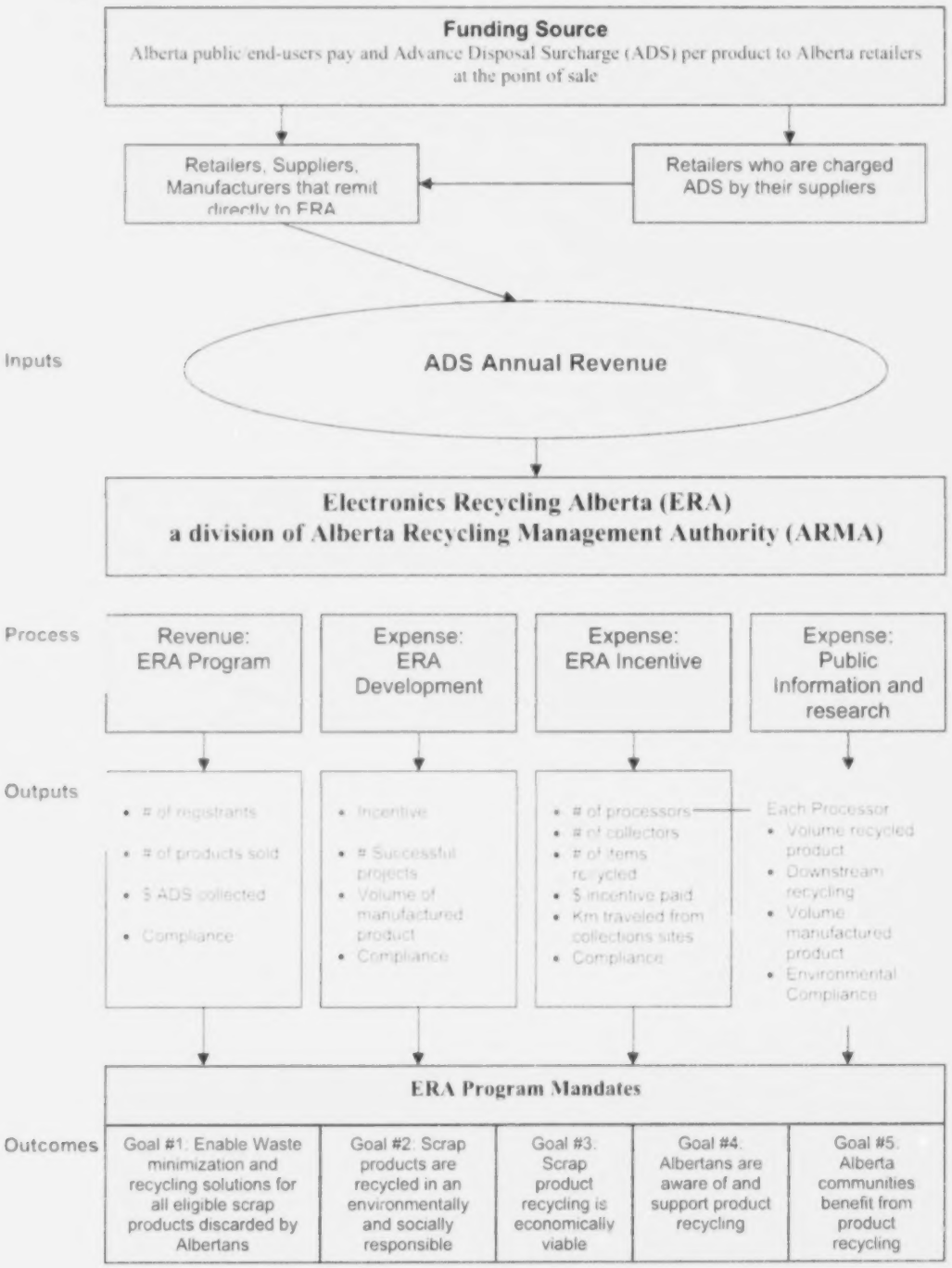


6.2 OVERVIEW OF NORTH AMERICAN AND EUROPEAN WASTE ELECTRONIC STEWARDSHIP PROGRAMS

The European Union has six members that initiated electronic recycling programs before the year 2002. The remaining members are currently in the process of creating waste electronic recycling schemes or have initiated programs within the fourth quarter of 2005. The United States has only two states with electronic recycling programs, Delaware and California as well as many decentralized pilot programs that have not been adopted in other states.

6.2.1 EUROPEAN WASTE ELECTRICAL AND ELECTRONIC EQUIPMENT SCHEMES

The European Union has begun to tackle the electronic recycling issue by drafting legislation termed the WEEE Directive. This directive outlines specific minimum standards and procedures for each EU member and manufacturer within each country to facilitate an electronics recycling program. Some key areas identified in this directive are objectives, scope, recovery, design of products, and financing. This directive is mandatory for all EU members and began to take affect in 2005.

The WEEE Directive

In 1998, a body of the European Union, the Directorate General XI (DG XI), drafted what is now called the Waste Electrical and Electronic Equipment (WEEE) Directive. This directive sought to reduce waste of electronic equipment by mandating specified collection and recycling targets for each EU member (There were 25 members in 2004). The exact definition of electronic equipment is set forth in the articles Directives Article 3:

> *Article 3(a): "Electrical and electronic equipment" or "EEE" means equipment which is dependent on electric currents or electromagnetic fields in order to work properly and equipment for the generation, transfer and measurement of such currents and fields falling under the categories set out in Annex IA and designed for use with a voltage rating not exceeding 1000 Volt for alternating current and 1500 Volt for direct current.*

The main purpose of this directive is

> *"...the prevention of waste electrical and electronic equipment (WEEE), and in addition, the reuse, recycling and other forms of recovery of such wastes so as to reduce the disposal of waste. It also seeks to improve the environmental performance of all operators involved in the life cycle of electrical and electronic equipment, e.g. producers, distributors and consumers and in particular those operators directly involved in the treatment of waste electrical and electronic equipment."*

Scope

The Directive aims to make the manufacturers, producers and retailers of electrical goods responsible for meeting the costs associated with the collection, recovery and treatment of waste products. The WEEE Directive is extremely broad in its scope and much broader than Alberta's legislation. It covers a wide variety of electrical goods used by consumers and in business, including:

- Large and small household appliances;
- IT and communication equipment;
- Consumer entertainment equipment (such as TVs, videos and hi-fis);
- Lighting;
- Electrical and electronic toys;
- Tools;
- Leisure and sports equipment;
- Medical devices (with some exceptions);
- Monitoring and control equipment; and
- Automatic dispensers.

Some categories are very wide, and several governments are currently pursuing clarification of this scope. Under the WEEE Directive, there are two stages of implementation. The Directive states that by August 13, 2005:

- Private householders will be able to return their waste electronics to collection facilities free of charge;
- Producers (manufacturers, sellers and distributors) will be responsible for financing the collection, treatment, recovery and disposal of waste electronics from private households deposited at these collection facilities;
- Producers will be responsible for financing the collection, treatment, recovery and disposal of waste electronics from users other than private householders for products placed on the market after August 13, 2005; and
- Producers will also be responsible for financing the management of waste electronics for products placed on the market before August 13, 2005 (historical waste).

By December 31, 2006:

- Producers will be required to achieve a series of demanding recycling and recovery targets for different categories of appliance; and
- Member States must have reached an average waste electronics collection rate of 4kg for each private householder annually.

Recovery and recycling targets will differ for the various types of waste electronics. For example, the Directive states that by December 31, 2006, for large household appliances and automatic dispensers, the rate of recovery will be a minimum of 80% by an average weight per appliance. Component, material and substance reuse and recycling will be a minimum of 75% by an average weight per collected appliance. The result is 60% of all material entering the waste stream for this product category is to be recycled.

However, for IT and telecommunications equipment and consumer equipment, the rate of recovery will be a minimum of 75% by an average weight per appliance. Component, material and substance reuse and recycling will be a minimum of 65% by an average weight per appliance. The result is approximately 50% of material entering the waste stream for this product category is to be recycled.

Currently there are only six countries with mature electronic recycling programs with the remaining EU members initiating a program in 2005 or currently in the preparation stages and expected to rollout a program in 2006. Table 6-1 identifies those countries and electronic recycling schemes as well as program start year. Two countries currently have multiple electronic recycling schemes, each with their own unique product scope and the remaining countries in the EU are currently drafting legislation and/or initiating electronic recycling programs. It is important to note, that the mature programs in the EU were either initiated by government legislation or consumer pressure and came into effect before the WEEE Directive was drafted.

Table 6-1
Country and Electronic Recycling Program Name and Year Established

Country	Scheme Name	Year established
Belgium	• Recupel	• 2001
Denmark	• Targeted Municipal Tax	• n/a
The Netherlands	• NVMP • ICT Milieu	• 1999
Norway	• El Retur	• 1999
Sweden	• El Kretsen	• 2001
Switzerland	• SWICO • S.EN.S.	• 1994 • 1990

6.3 EUROPEAN JURISDICTION SUMMARIES

The following sections outline in detail the nature of benchmarked programs. They highlight governance structures, program scopes, financing/funding structures, collection mechanisms, processing schemes, and program results found within these jurisdictions.

6.3.1 BELGIUM - RECUPEL

Governance

Recupel came into force in July of 2001 and is an industry operated not-for-profit organization that does not enforce mandatory registration of applicable registrants. Recupel has identified its goal and mission as "to collaborate with municipalities, certified organizations, and retailers to ensure that recycled equipment is discarded in an effective way, thus contributing to a better environment."[3] Its vision is to "strive for a world with less waste through the organized collection of environmentally responsible recycling of all waste electrical and electronic equipment, and thus intends to be a reliable partner for industry in the execution of its take-back obligation."[4] The purpose of Recupel is to establish a system of obligation to take back waste electronics for companies that produce or sell such equipment on the market.

Recupel consists of six sector specific management bodies that manufacturers and retailers of waste electronics belong to dependent on the category of product being supplied. These management bodies are primarily financing companies that manage the assets for the waste electronics in a given sector, all other management and administration is performed by Recupel. LightRec has recently been established in 2004 to manage the lighting equipment waste electronics in the industry sector.

- Recupel A/V (consumer electronic equipment)
- Recupel SDA (small household appliances)
- Recupel ICT (IT, office and telecommunications equipment)
- B/W – Recupel (household appliances)
- Recupel ET & Garden (electrical and gardening tools)
- LightRec (lighting equipment)

Scope

As shown above, each industry specific body of Recupel has a grouping of products that are applicable under the program and is very broad in scope. Recupel does not include all product categories identified in the WEEE Directive and does not include medical devices or toys and leisure equipment in the program.

Financing

[3] http://www.recupel.be
[4] Recupel 2004 Annual Report

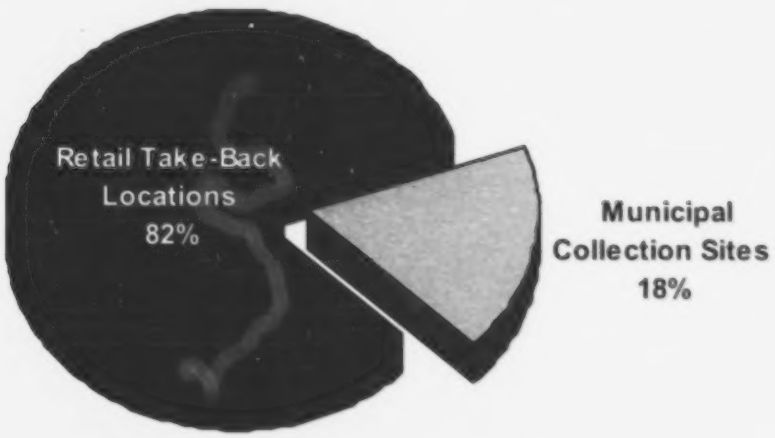
Each product category and subcategory of applicable products has a fixed fee attached that is utilized for the end-of-life recycling, similar to ERA's ADS. All fees under the scheme have the 21% Euro value added tax (VAT) that are included in the fee and are visible on the invoice or receipt when the product is purchased. These fees are adjusted yearly based on future sales estimates of each product category type into the market from data that is declared by the industry. While there is cross-subsidization of fees between the products in specific product categories, there is no cross-subsidization between the six sector specific management bodies and the fees charged are used to fund program costs. A sample product list and prices is included as Appendix L.[5]

Collection

Consumers have two options for disposing of waste electronics under the program. Consumers have the responsibility to take the products to a municipal waste facility; free of charge, where special Recupel bins for the various product categories can be found (large white appliances, cooling and freezing appliances, televisions/monitors and other appliances). There are 518 municipal waste facilities located throughout Belgium, approximately 1 site for every 20,000 people and there are 2,374 retailers currently registered under the program. Consumers may also dispose of waste electronics under a retail-take back program on a one-for-one basis. Exhibit 6-3 illustrates the breakdown of municipal waste sites and retailers in Belgium.

Waste electronics collected by the retailers have two possible methods for collection, 1) retailers can discard the waste electronics at municipal waste sites, free of charge, at regional "transhipment" centers that are regional collections points where waste is directed, or they can arrange to have a collection agency pick up the waste electronics at the retail location for an additional charge.

Exhibit 6-3
Number of Municipal and Retail Collection Sites in Belgium

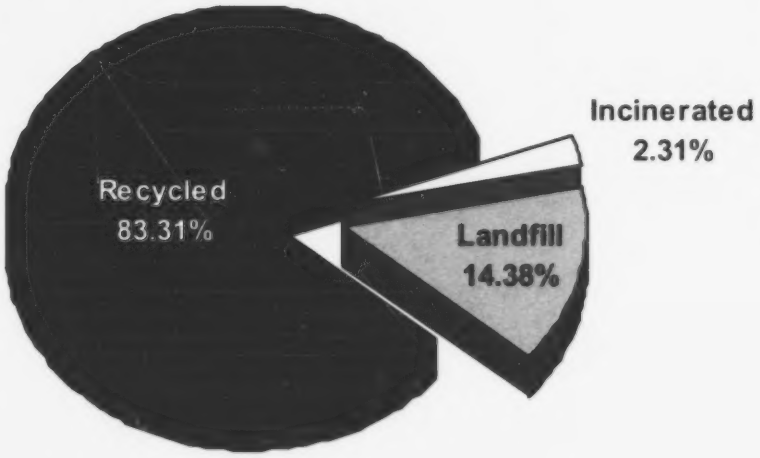


[5] The entire product list is available online at http://portal.recupel.be/portal/page?_pageid=108,152507,108_152531&_dad=portal&_schema=PORTAL

Processing

Once the waste electronics are collected, the products are shipped to treatment centers for dismantling and/or sorting and to processors where they are recycled. Contracts are tendered to processors, and Recupel and their agents audit them vigorously. Recycling targets established in the Environmental Policy Agreements in Belgium are higher than those set out in the WEEE Directive. In the 2004 annual report, Recupel has identified that of the 58,063 tonnes of eligible material collected, 83.3% of this material was recycled, 14.4% landfilled, and 2.3% incinerated or used for energy creation. Exhibit 6-4 illustrates the recycling performance for Recupel.

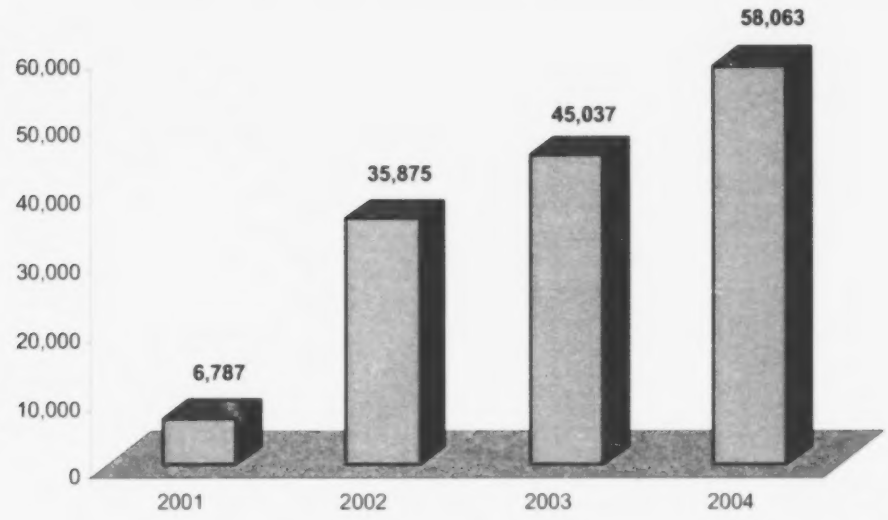
Exhibit 6-4
Recupel Recycling Performance



Results

Recupel has indicated in their 2004 Annual Report that approximately 200,000 tonnes of waste electronics was sold and 58,063 tonnes was collected in 2004 for an approximate 29% recovery rate. On a per capita basis, 5.6 kg of eligible material was collected for each individual in Belgium. Exhibit 6-5 illustrates the historical tonnes collected.

Exhibit 6-5
Tonnes Collected Per Fiscal Year in Belgium



6.3.2 DENMARK – TARGETED MUNICIPAL TAX

Governance

The waste electronics scheme in Denmark is unique when compared to the other established schemes. The Danish "Statutory Order on Management and Waste from Electric and Electronic Products" came into force in December of 1999. This legislation has placed responsibility for collection and processing of waste electronics directly on each of the municipalities who have direct control over financing and logistics, and remain legally responsible for the products when they are shipped abroad for treatment.

There are approximately 275 municipalities in Denmark, and they have formed 32 joint municipal-waste management companies that administer regional waste services. Out of these organizations, two national collectives have been formed, Afflad Denmark and Renosam, that mimic waste electronics schemes in the other EU members. These collectives represent approximately two thirds of Denmark's population.

Scope

All products identified under the WEEE Directive are applicable under the program and collected by each municipality with the exception of all refrigeration products that contain CFC's, batteries and lighting equipment.

Financing

Funding for the program is done via a "local household waste tax" administered by each local municipality. Each municipality has direct control of the tax and usually varies depending on the costs of the regional collection infrastructure. The estimated average tax is $7.45 CDN per household per year.[6] Collection and treatment is provided by the private sector through subcontracting with contract bids tendered by the joint municipal partnerships or the National Collectives.

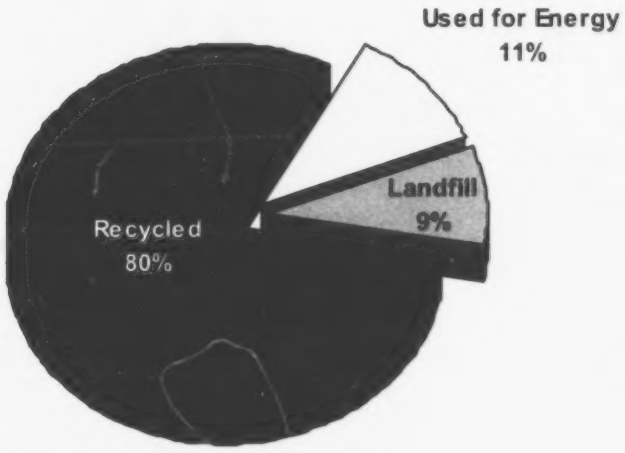
Collection

Due to the highly decentralized manner of the scheme, there is less integration between municipalities and regions when compared to other EU schemes. Administration, transportation, processing, infrastructure and marketing are specific to each location in the country. Also, there is no central data collection organization created, and measuring achievement of the minimum WEEE Directive standards may be more difficult to verify by European enforcement agencies. At these locations products are grouped into three categories, 1) refrigeration items, 2) electronic items with screens and 3) electronic items without screens.

Processing

There are approximately 30 processing facilities in Denmark that are subcontracted by municipalities and collectives to recycle the country's waste electronics. The majority of these facilities are owned by private organizations while a small few have been built and are owned by municipalities. Approximately 80% of the waste materials collected are recycled with the remaining 11% used for energy and 9% landfilled. Exhibit 6-6 illustrates the recycling performance in Denmark.

Exhibit 6-6
Denmark Recycling Performance



[6] Study into European Waste Schemes – Future Energy Solutions

Results

Denmark has collected 4.84 kg per capita of waste electronics in 2002, approximately 26,000 tonnes.

6.3.3 THE NETHERLANDS – NVMP/ICT MILIEU

Governance

In 1999 legislation came into effect in The Netherlands called the "Disposal of White and Brown Goods Decree." In short, this legislation mandates environmentally friendly collection and recycling of electronic products while placing all responsibility for this on manufacturers and retailers. These organizations must notify the Ministry of Environment of:

- The manner in which the goods are collected,
- The percentage of the products that are to be re-used,
- The manner in which the remaining percentage is to be disposed of,
- The manner in which the system will be financed, and,
- The checking and reporting means that have been put in place.

In response to this decree, the manufacturers and retailers created two bodies to oversee waste electronics management in compliance with the legislation, the Netherlands Association for Disposal of "Metalectro" Products (NVMP) and ICT Milieu. NVMP was founded by five associations and consists of two organizations, an association responsible for policy matters on the management of white and brown goods and a foundation bearing the same name, which is responsible for implementing collection and recycling. The five founding associations are:

- The Foundation for White Goods,
- The Foundation for Brown Goods,
- The Foundation for the Transformation of Electric Fans,
- The Foundation for the Disposal of Electric Tools, and,
- The Foundation for the Recycling of Metal and Electric Products.

Scope

NVMP is responsible for all waste electronics identified by the WEEE Directive with the exception of lighting equipment and IT/professional equipment that is covered by ICT Milieu.

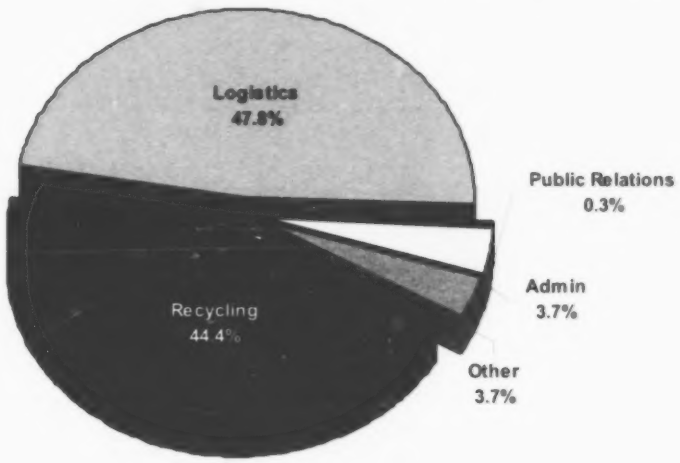
Financing

When this equipment is sold a fixed fee, much like ERA's ADS and the fees in Belgium, is collected by the seller as a disposal fee for the product being sold that is charged to consumers. Every two months the producers declare the

quantity of goods being sold to the market and forward the collected levies to NVMP. To reduce the amount of applicable products and ease administrative costs for retailers, some smaller goods (e.g. electric razors) do not have the visible fee attached. Processing costs for these products are funded through cross-subsidization from larger products to which the fee applies.

ICT Milieu operates under a different financial model than NVMP. Essentially, funds collected are based on a market share system where recyclers report how much product is being recycled for each manufacturer. For confidentiality purposes, all collection of funds is handled by an external third party, Cap Gemini Ernst and Young, through what is called a "black box" program.[7] This "black box" sends payments to recyclers and transporters, tracks all financial information and invoices members based on incoming data. Exhibit 6-7 illustrates the cost allocation for ICT Milieu.

Exhibit 6-7
ICT Milieu Program Cost Structure



Collection

Consumers bear the responsibility to dispose of the products in an appropriate manner, either by returning the end-of-life product back to the retailer in a one-for-one exchange free of charge at the time when the new product is purchased, or by discarding the item at a municipal waste facility, also free of charge. There are approximately 540 municipal waste sites located within The Netherlands. If consumers wish to have products picked up by the retailer at their residence, retailers can charge a removal fee at their discretion. The same disposal processes applies to consumers whether the product falls under the NVMP or ICT Milieu program.

Retailers have several options for recycling products that are returned by the customers. Not only can they discard the items at municipal waste sites but they also have the option to take the equipment to Regional Storage Stations (approximately 70) that are usually within 20km of a municipality, return to the retailer distribution center for pick-up

[7] Study into European Waste Schemes – Future Energy Solutions

by a NVMP transport service, or have the same NVMP transport service pick-up the product at the retailer location. One unique feature that is not consistent throughout the established European schemes is that retailers are reimbursed 10% of the collected fees for storage and administration costs incurred. Businesses wishing to dispose of equipment under the ICT Milieu program can return the waste electronics back to the manufacturer on an old-for-new basis, sell the equipment to third parties for disposal, or have their usual industrial waste collector pick-up the waste electronics.

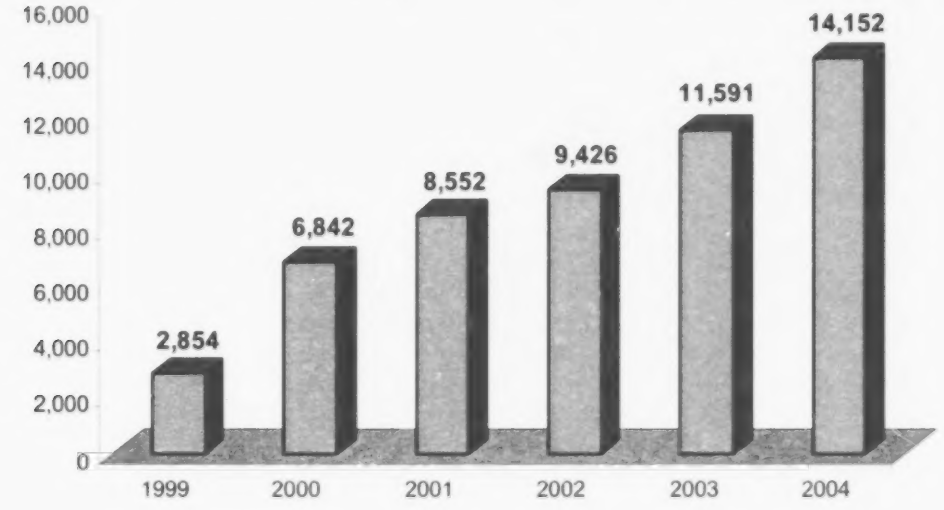
Processing

All discarded electronics are then transported to the Regional Storage Stations where they are sorted and then transported to the specialized recycling firms. Much like other European schemes, recycling and transportation is subcontracted to various external companies, however only one transport company is contracted at a time. In 2002, NVMP recycled approximately 80% and ICT Milieu recycled approximately 89% of materials collected with the remainder of materials sent landfills. The Netherlands prohibits the incineration or burning of waste materials collected.[8]

Results

NVMP collected 65,856 tonnes of waste electronics in 2002, or 4.1 kg per person. ICT Milieu collected 8,552 tonnes of waste electronics in 2002, or 0.54 kg per person. Collectively both schemes collected nearly 4.7 kg per capita, a result that is much lower than other mature programs in Europe. Exhibit 6-8 illustrates tonnes collected per year for ICT Milieu.

Exhibit 6-8
Tonnes Collected Per Fiscal Year for ICT Milieu



[8] Study into European Waste Schemes – Future Energy Solutions

6.3.4 NORWAY – EL RETUR

Governance

In March of 1998, the Ministry of the Environment passed legislation called the "Regulations Regarding Scrapped Electrical and Electronics Products." This legislation stipulated different obligations and processes for distributors, retailers and municipalities as a framework for disposing and recycling waste electronics. Some of the main stipulations are as follows:

- The Distributor of EE (electronic equipment) Products shall be obliged to accept consumer returns of EE Waste free of charge at his place of business but not commercial waste (business-to-business) unless it is against the purchase of an equivalent quantity of new goods.
- The Municipality shall be obliged to ensure that adequate facilities for the reception of consumer EE Waste exists free of charge. The Municipality shall also be obliged to receive commercial EE waste, but may charge for this service.
- The Producer/Importer of EE Products shall be obliged to ensure that materials and components of EE Waste that is hazardous is sorted and disposed of at an approved treatment facility.

Two organizations in Norway, Elektronikkretur AS and Hvitevareretur AS, were established by the trade organizations under a 1998 Trade Agreement with the Norwegian Ministry of the Environment. In short, both are not-for-profit, take-back organizations to administer the obligations set forth in the legislation. Recently, both organizations have merged activities to become Elretur AS in order to increase efficiency.

The Norwegian Ministry of the Environment updated this legislation in 2005 in order to reduce a "free rider" problem within Norway, as the program was not mandatory. Three main alterations and additions have been identified; 1) the burden of proof has been reversed and now the individual manufacturers and retailers must now document that the company has set up an individual take-back scheme or is a member of an approved collective scheme which fully complies with the regulations requirements, 2) an objective certification system for take back schemes will be introduced, and 3) A manufacturer and retailer register will be established to administer certification and ensure that collection and treatment results correspond with the manufacturer and retailer responsibilities.[9]

Scope

All products identified under the WEEE Directive, with the exception of lighting equipment and products permanently installed as transport means in large devices (i.e. lifts and escalators), were applicable under the program in 2004.

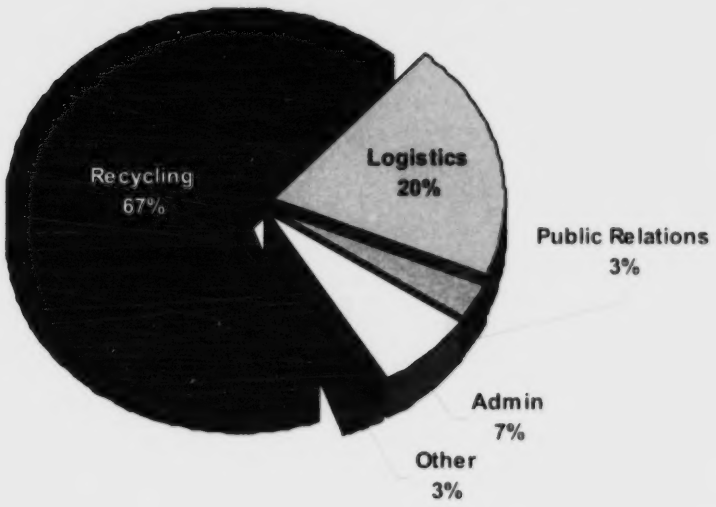
Financing

Elretur AS finances the costs of recycling by collecting a fixed environmental fee, much like ERA's ADS and other European schemes, which is collected from the consumer. The fee can either be visible on invoices or included in the price of the product, which is at the discretion of each individual retailer as there is no requirement for the fee to be visible. What separates El Retur and the other similar European schemes is that each affiliated company declares the

[9] El-Retur 2004 Annual Report

amount of product produced or imported into the county to a government department called the Norwegian Directorate of Customs and Excise (NDCE). The fees are paid to the NDCE, along with other taxes and levies, and then transferred to El Retur. This system can operate in this regard as Norway lies outside the European Customs area and can operate outside the EU regulations. Exhibit 6-9 illustrates the cost structure of this program.

Exhibit 6-9
El Retur Program Cost Structure



Collection

Consumers or end-users have two options for recycling waste electronics, 1) dispose of the product at a municipal waste facility free of charge, or 2) return the product at a retail location without an obligation to make a further purchase. Businesses may return waste electronics to 1) Other retailers/suppliers that sell the same product in return for making a further purchase on a one-for-one basis, or 2) Municipal waste sites who may impose a charge. El Retur supplies containers and cages for waste electronics disposal to municipalities, retailers, offices, industry and associated producers free of charge. There are approximately 3,100 retailers registered under the program. [10]

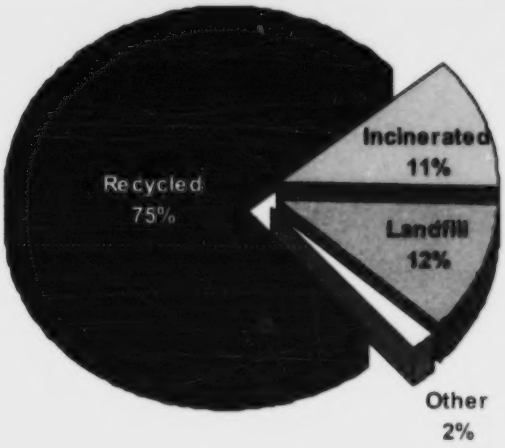
Processing

El Retur has subcontracted six logistics companies to collect waste electronics from the various collection points from across the country. Once the waste electronics are collected, most of the products are transported to a recycling plant called Stena, which is one of 12 recycling facilities in Norway. This plant is designed to handle approximately 35,000 tonnes of waste electronics per annum, but is currently processing approximately 25,000 tonnes per annum, which is around half of total tonnage collected in 2004.[11] Products are then sorted, disassembled and then properly recycled.

[10] El-Retur 2004 Annual Report
[11] El-Retur 2004 Annual Report

Stena has reportedly invested extensively on developing efficient methods and solutions and report a 99% recycling rate of most of the products that are received while El Retur as a whole has a recycling performance of approximately 75%.[12] Exhibit 6-10 illustrates El Retur's recycling performance.

Exhibit 6-10
El Retur's Recycling Performance



Results

In 2004, El Retur collected 55,875 tonnes of waste electronics or 12.21 kg per person. On a per capita basis, El Retur exceeds all other mature European schemes by nearly 2 kg per person.

6.3.5 SWEDEN – EL KRETSEN

Governance

In July of 2001, legislation passed by the Swedish Government called Ordinance SFS 2000:208 came into effect. This legislation enacted a concept deemed Extended Producer Responsibility (EPR), and provided an obligation for manufacturers and retailers to set up a system of free take-back on a one-for-one purchase of equipment with a similar function. The legislation made preliminary treatment of waste electronics (i.e. sorting and dismantling) mandatory and did not establish recycling targets, or end uses for waste electronics (i.e. recycled, incinerated, or sent to landfill). The manufacturers and retailers created a not-for-profit organization called El Kretsen to fulfill their producer take-back responsibility in Sweden and coordinate all logistics and administration. El Kretsen is governed by 20 industrial organizations and now operates in conjunction with Local Regional Authorities (LRAs) in order to facilitate proper collection through existing municipal infrastructure.

[12] El-Retur 2004 Annual Report

The legislation provided one exception where producers were not liable for the collection of the waste electronics on in the market. In the event where there is a business-to-business transaction (B2B), the consumer of the product who does not exchange old product for new will be responsible for the preliminary treatment of waste electronics, (sorting, dismantling and disposal).

Scope

The scope of this program, like other EU schemes, covers a wide range of products and El Kretsen is responsible for the following product categories:

- Products for household use,
- Hand tools and garden tools,
- IT and office equipment,
- Telecommunication equipment,
- Television, audio and video equipment,
- Photographic equipment, and,
- Watches and Clocks.

The following products were excluded from the Ordinance SFS 2000:208:

- Freezers and Refrigerators,
- Fixed installed equipment for heating and ventilation,
- Permanently installed equipment (fuses, control devices, detectors),
- Batteries,
- Dispensers, and,
- Production Equipment.

Financing

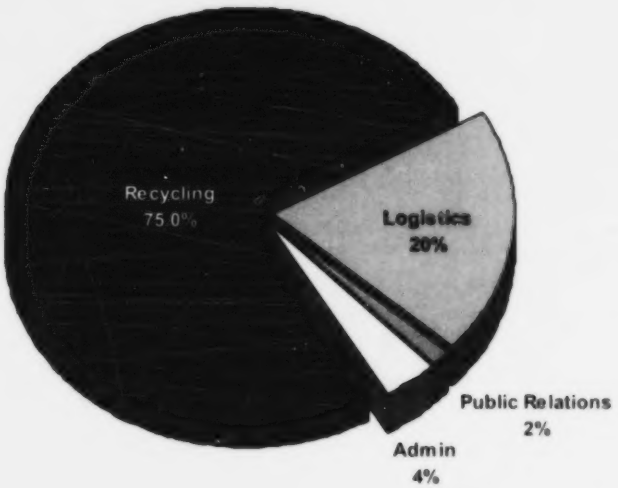
There are currently 22 recycling companies in Sweden and one in Norway under contract for the treatment of discarded waste electronics. All companies are contracted through an open bidding process where price, technical expertise and geographical location are crucial. El Kretsen members pay a fee based upon declared new sales of applicable products each year that differs by type of product. There are three main payment structures and are as follows:

- Per Unit – Companies are required to complete a company specific sales return detailing the previous month's sales and types of products sold. The sales volume is then applied to a table indicating the amount of fixed fee per unit of each type of product. When products are exported, a credit is issued.

- IT Sector – The IT industry has designed a specific payment method due to past discontent with El Kretsen's per unit financing model. In 2003, the entire IT sector pulled out of El Kretsen and fulfilled their obligation to take-back waste electronics one-for-one, they have since rejoined under this payment model.
- Each month, El Kretsen calculates the cost for collection and recycling of waste IT products in Sweden. The actual costs are then divided between the suppliers in proportion of their sales and charged to the appropriate manufacturers. The market share is defined as sales volume of the previous year, expressed in tonnes, not per unit.
- IT producers are able to recycle their own products, but the method must be approved by El Kretsen in order to be exempted from this process. If a producer is not exempt and does not pay the applicable fees, a 25% mark-up of the previous year's sales data will be used to calculate the amount owing.
- Other – Other industries and sector's are able to declare yearly sales volumes and report once a year. Again, if no fee is received, El Kretsen will calculate fees based upon previous sales volumes and surcharge an additional 25%.

The fees paid by the manufacturers are then charged through the supply chain to consumers similar to ERA's ADS. Swedish marketing law requires that consumers see the total price of the product only and subsequently; the fees paid to El Kretsen are included in the price. The product list and price is included as Appendix J. Industry sectors and retailers have been identifying on invoices that the fee has been paid to El Kretsen and included in the sale price of the product. There are also initial entry fees of approximately $515.00 CDN and yearly membership fees of $75 CDN that are also charged. Exhibit 6-11 illustrates the program cost structure for El Kretsen.

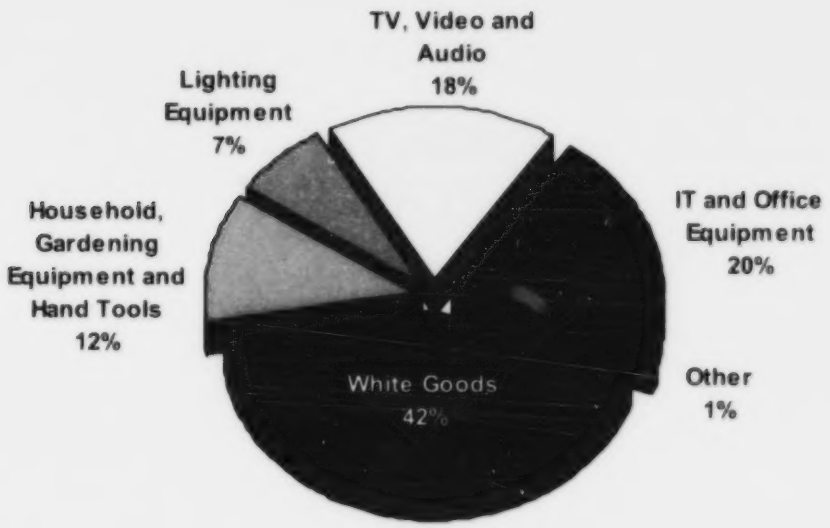
Exhibit 6-11
El Kretsen Program Cost Structure



Collection

El Kretsen established agreements with the LRA's to use existing infrastructure for centralized collection methods. There are approximately 650 municipal collection sites for the public, 300 other manned collection sites for commercial users, and approximately 3,000 registered producers that all take-back waste electronics free of charge.[13] There is also limited curbside pick-up in urban areas. El Kretsen contracts out transportation of the waste electronics to various treatment facilities on a two-year cycle. During the previous cycle, there were 19 transportation companies under contract. Exhibit 6-12 illustrates the breakdown of waste electronics collected in Sweden.

Exhibit 6-12
Breakdown of Waste Electronics Collected in Sweden



Processing

As mentioned earlier, there is no recycling target in Sweden and annual reports do not indicate recycling performance. The legislative authority and El Kretsen have indicated that the aim is to collect as much waste electronics as possible. Other data indicates that El Kretsen is approximately recycling 70% of waste electronics, incinerating 20%, and disposing the remaining 10% of materials into landfills.[14]

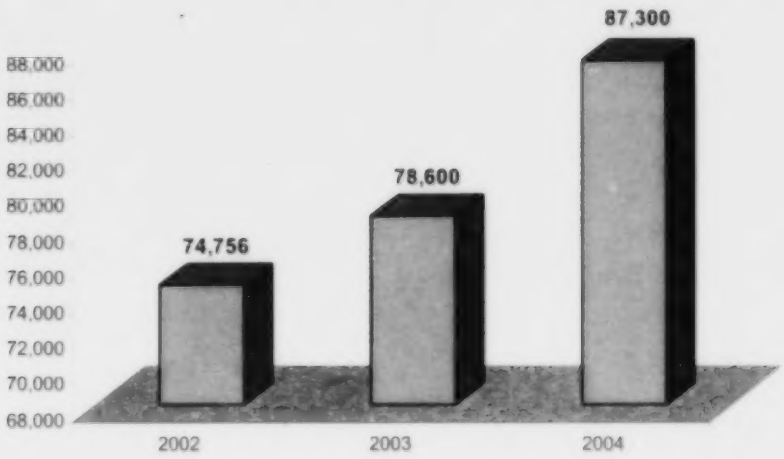
Results

El Kretsen collected 87,300 tonnes of waste electronics in 2004, the most tonnes collected of any mature electronics recycling program. This translates into 9.69 kg per person, one of the highest per capita rates in Europe. Of all waste

[13] El Kretsen 2004 Annual Report
[14] Study into European Waste Schemes – Future Energy Solutions

electronics collected, white goods represent the majority at 42%. Exhibit 6-13 illustrates the breakdown of waste electronics collected for each product category in 2004.

Exhibit 6-13
Tonnes of Waste Electronics Collected in Sweden



6.3.6 SWITZERLAND – SWICO/S.EN.S

Governance

Switzerland, like the Netherlands, has two parallel organizations coordinating the collection and recycling of waste electronics products in the country. In December of 1993, the Swiss Association for Information, Communications and Organization Technology (SWICO) introduced the SWICO Recycling Guarantee (SRG). This was a reaction to consumer pressure to hand in end-of-life products regardless of brand, to retailers. In 1998 the Swiss Government introduced an ordinance called the Order on Return, a take-back and disposal of electrical and electronic equipment or ORDEA, legislating the obligation for manufacturers and retailers to, 1) take-back waste electronics free of charge, 2) for consumers to hand in used equipment to the trade, 3) for distributors, retailers and manufacturers to dispose to the equipment that is taken back, 4) for recycling companies to possess a cantonal license[15], and 5) for export companies to possess a federal license. SWICO's four guarantees are as follows:

- Manufacturers and retailers guarantee to provide an ecological solution,
- The SRG guarantees a country-wide concept for taking back equipment,
- The SRG guarantees a control over the recycling companies and their customers, and,
- The SRG guarantees secure financing.

[15] A regional Swiss license

The second system in Switzerland, the Foundation Disposal Switzerland (S.EN.S) was formed in 1990 as a charitable organization, has transformed into an administrative organization for electronics recycling.

Scope

SWICO is currently responsible for the following product groups:

- Consumer electronics,
- Information Technology and Office Equipment,
- Telecommunication Equipment,
- Household appliances, and,
- All components originating from the above equipment.

S.EN.S. is currently responsible for the following product groups:

- White goods,
- Small domestic appliances,
- Gardening Equipment,
- Tools, and,
- Toys.

Collection

Collection of the waste electronics for both S.EN.S. and SWICO is similar to other European schemes in the fact that they utilize a retail take-back system and municipal collection. Since both programs share infrastructure, it is difficult to obtain specific program data. S.EN.S. has indicated that there are 500 official S.EN.S. collection points that include 100 municipal sites[16] and SWICO has indicated that waste electronics can be discarded at 340 collection points.[17] Municipalities are under no obligation to take back waste electronics under the current legislation.

Financing

Financing for both programs is identical and utilizes a similar structure to the Swedish El Kretsen scheme. Manufacturers and retailers must declare annual sales of each applicable product to both SWICO and S.EN.S. and the fees paid to the programs are charged to the consumers of the product in the form of an Advanced Recycling Fee (ARF). This ARF is similar to ERA's ADS as different product categories have a fixed fee that is added to the price of the product at the time of purchase. This fee covers all program costs such as administration, transportation, recycling and marketing. Exhibit 6-14 illustrates SWICO's program cost structure and Exhibit 6-15 illustrates S.EN.S.'s program cost structure.

[16] http://www.sens.ch/SENS_two_pager_041203.pdf
[17] 2004 SWICO Annual Report

The difference between SWICO and ERA is that some IT products in SWICO have a variable ARF charged depending on the price of the product. This variable ARF is only applicable to products with a sale price above approximately $52.38 CDN and can range approximately from $1.05 CDN to $1571 CDN depending on the total sale price of the IT products (the maximum amount of ARF is charged on products costing over $628,573 CDN) depending. All other applicable products under the program have a fixed fee approximately between $1.05 CDN to $20.95 CDN per unit. The 2005 ARF fees for S.EN.S. range from $0.52 CDN to $94.29 CDN.[18] SWICO's new product list for 2006 is included as Appendix K.

Exhibit 6-14
SWICO Program Cost Structure

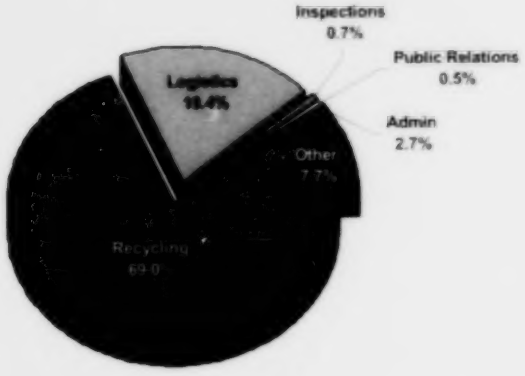
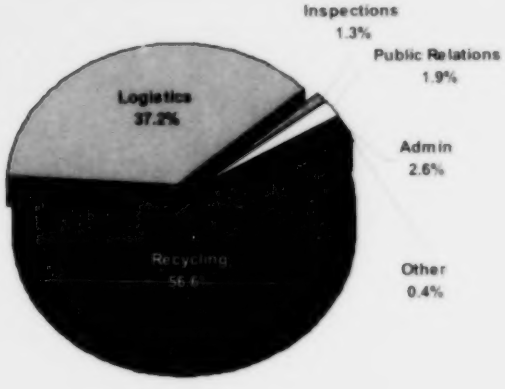


Exhibit 6-15
S.EN.S. Program Cost Structure



[18] An average 2004 exchange rate of 1.00 CHF equals $1.04762 CDN was used for the ARF calculations

The difference between SWICO and ERA is that some IT products in SWICO have a variable ARF charged depending on the price of the product. This variable ARF is only applicable to products with a sale price above approximately $52.38 CDN and can range approximately from $1.05 CDN to $1571 CDN depending on the total sale price of the IT products (the maximum amount of ARF is charged on products costing over $628.573 CDN) depending. All other applicable products under the program have a fixed fee approximately between $1.05 CDN to $20.95 CDN per unit. The 2005 ARF fees for S.E.N.S. range from $0.52 CDN to $94.29 CDN. SWICO's new product list for 2006 is included as Appendix K.

Exhibit 6-14
SWICO Program Cost Structure

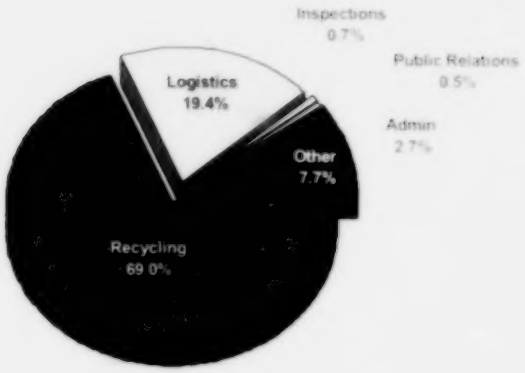
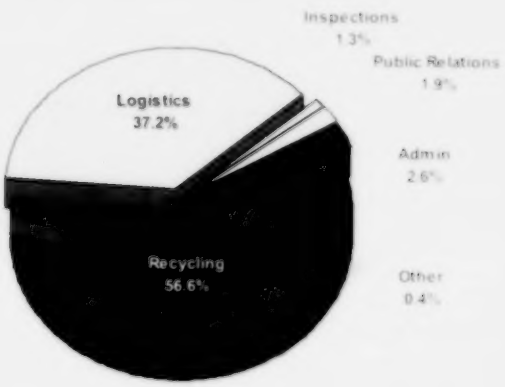


Exhibit 6-15
S.E.N.S. Program Cost Structure



[18] An average 2004 exchange rate of 1.00 CHF equals $1.04762 CDN was used for the ARF calculations.

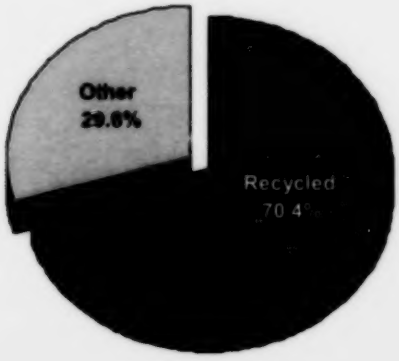
Transportation

The waste electronics are transported to recyclers and/or dismantlers. S.EN.S. has indicated that they have subcontracted eighty-five external transport companies to transport the waste electronics to twenty-seven subcontracted recyclers.[19] In comparison, SWICO has indicated that they have three regional transport partners, fifty subcontracted dismantling companies, and 15 subcontracted recycling companies to perform the logistics of the transportation and recycling processes.[20]

Processing

SWICO has indicated that approximately 70% of materials collected are eventually processed into secondary materials. The remaining amounts are not sent to incineration plants or landfills, but used internally as fuel for the individual processing steps. Exhibit 6-16 illustrates SWICO recycling performance.

Exhibit 6-16
SWICO Recycling Performance

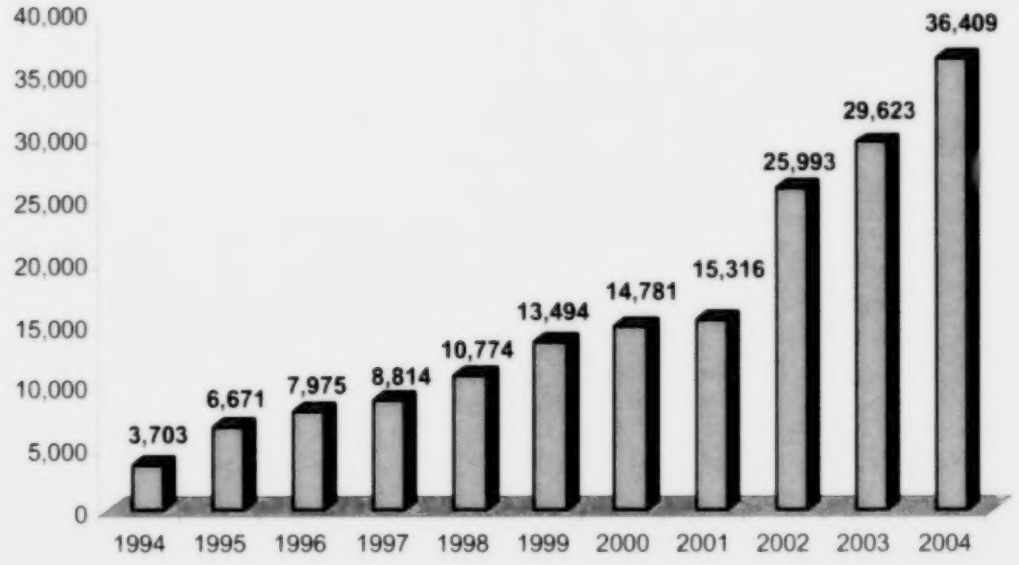


Results

SWICO collected 36,409 tonnes and S.EN.S. collected 39,614 tonnes of waste electronics in 2004. As a whole, the two programs collected 10.25 kg per person, the 2nd highest per capita rating in Europe. Exhibit 6-17 illustrates the historical tonnage of waste electronics collected by SWICO.

[19] http://www.sens.ch/uploads/1121786329_Dokument_sens_keyfigures_04_e.pdf
[20] www.swico.ch and SWICO 2004 Annual Report

Exhibit 6-17
Historical Tonnage of Waste Electronics Collected by SWICO



6.4 NORTH AMERICAN WASTE ELECTRICAL AND ELECTRONIC EQUIPMENT SCHEMES

The United States currently has two electronics recycling programs in Delaware and California. Electronics Recycling Alberta is the first provincial program in Canada. Compared to Europe, North America lacks the same number of mature programs and does not have comparative legislation to the WEEE Directive. The three programs currently operational are smaller in scope in comparison to the European programs and two are in their infancy. There are many pilot electronics collection programs in various states across the U.S., but no other jurisdictions have passed legislation to administer any statewide programs.

6.4.1 DELAWARE – VOLUNTARY RECYLING PROGRAM

Governance

Waste management and recycling in the state of Delaware is administered by Delaware Solid Waste Authority (DSWA) which is a government agency that oversees a multitude of waste and recycling logistics throughout the state that covers essentially all possible products that enter the waste stream such as paper, plastic, metal cans, oil and electronics. "Recycle Delaware" is a voluntary program initiated by the DSWA in 2001 to create a source-separation initiative so that waste products can be easily classified, sorted and then transported to an appropriate recycling facility.

Scope

The scope of the electronics recycling program in Delaware is small compared to European programs. Applicable products include IT equipment (computers, monitors, printers and laptops), telecommunications equipment (cell phones, telephones, fax machines etc.), audio and video equipment (radios, TV's, VCR's, video cameras etc.), toys, microwaves and toasters.

Financing

Funding for this program comes is from user fees paid by residents and from tipping fees at one of three landfills owned by the DSWA. There is no additional funding or grants from Federal, State or Local Authorities. The DSWA expenditures are consolidated for all product categories attributable to non-electronic products and programs. A breakdown of administrative costs associated directly with electronic recycling cannot be determined.

Collection

This program is similar to Alberta as all materials collected are via municipal waste facilities. Each municipal waste facility in Delaware has clearly marked containers for the type of product that is to be recycled. There are approximately 140 sites across the state, yet the number of electronic waste sites is much smaller as there are only seven electronic recycling collection points that accept applicable products under the program. The DWSA has also recently begun limited curbside recycling for an extra charge of $6.00 USD per month.

Processing

The collected material is transported to the Delaware Reclamation Plant (DRP) or what is better know as the Delaware Recycling Center (DRC) by a subcontracted transportation organization. The DSWA has indicated that approximately 85% or more of the material collected is recycled into material that is later sold within the state of Delaware; exact results are unavailable.[21]

Results

Despite a very small State population (817,491), the recycling program collected approximately 975 tonnes of waste electronics in 2004, over 1 kg per person.

6.4.2 CALIFORNIA – VOLUNTARY RECYCLING PROGRAM

Governance

California has recently introduced an electronic recycling program throughout the state in 2005 and is administered by the California Department of Toxic Substances (DTSC) and the California Integrated Waste Management Board (CIWMB). Both of these departments are members of the Environmental Protection Agency (EPA). This program is unique compared to other electronic recycling programs as a branch of a government department administers it with no involvement from industry members. Like Delaware, recycling is voluntary and the DTSC and CIWMB have created an easier set of means for consumers to discard waste electronics.

[21] DSWA 2004 Recycling Report and http://dswa.com

Scope

The new program in California has the smallest scope in comparison to electronic recycling programs in North America and Europe. Only televisions, CRT, and LCD monitors greater than 4 inches are eligible under the program.

Collection

Waste electronics are discarded at over 300 retailers, manufacturers and municipal sites throughout the state. Once the waste is collected, an undisclosed number of contracted transportation companies deliver the waste electronics to 40 approved recyclers in the state.

Financing

Financing for the program is similar to other established electronic recycling programs. A visible, fixed fee per unit called the Electronic Waste Recycling Fee (EWRF) is charged at the time of purchase to consumers and is collected by the Board of Equalization from the retailers. This board collects a variety of government taxes in California and then transfers the recycling funds to CIWMB, a similar process to Norway's NDCE. The fee charged to consumers is similar to ERA's ADS except the fees are much smaller in comparison. The California program charges $6.00 to $10.00 USD (or $7.26 to $12.10 CDN) for televisions 4 inches or greater in screen size. A summary of the EWRF is included as Appendix I. ERA currently charges $15.00 to $45.00 depending on screen size, the maximum amounts identified in Alberta's legislation. Retailers in California are reimbursed 3% of fee that they collect for administration costs incurred.

Processing

No current information could be sourced regarding recycling performance for the waste electronics as this program is in its infancy. The CIWMB has indicated that all participants must submit required reports by the end of the 2005 fiscal year.

Results

During the first six months of the program, the CIWMB has indicated that approximately 29.5 million pounds (13,381 tonnes) of applicable waste electronics have been collected. Due to California's high population, this large tonnage of collected waste electronics represents approximately 0.37 kg per capita. In comparison, Alberta collected 1000 tonnes in the first six months of the program for approximately 0.31 kg per capita.

6.5 GOVERNING STRUCTURE

The following table outlines the governance structure for each of the recycling programs summarized. All European jurisdictions with the exception of Denmark have Producer Responsibility Organizations (PRO's) that administer the recycling obligation for industry members. Denmark is the only jurisdiction where all responsibility for recycling lies with each municipality and California is the only program where a Government Agency has direct control. Delaware and ERA have organizations with delegated authority from a government department. Table 6-2 illustrates governance structure for each electronics recycling program reviewed.

Table 6-2
Governing Structure of Electronic Recycling Programs

Program	Delegated Organization	Government Agency	Producer Responsibility Organization	Municipal Responsibility
ERA	√			
Recupel			√	
Denmark Tax				√
NVMP			√	
ICT Milieu			√	
El Retur			√	
El Kretsen			√	
SWICO			√	
S.EN.S.			√	
Delaware	√			
California		√		

- **Delegated Organization** – A delegated organization is an entity that has been assigned the responsibility to administer a legislated government program. Reporting to a government department, these organizations have the authority to generate revenue and are governed by a board of governors. Electronics Recycling Alberta and Delaware Solid Waste Authority are both organizations that have been delegated the responsibility to oversee and administer the electronics recycling programs in each respective jurisdiction.

- **Government Agency** – This type of governing structure is either a branch of a government agency or department. For example, the California Department of Toxic Substances (DTSC) and the California Integrated Waste Management Board (CIWMB) administer California's new TV recycling program. Both of these departments are members of the Environmental Protection Agency (EPA) and the Board of Equalization

(BOE), a department that subsequently collects a variety of taxes in California, collects all fees associated with the program.

- **Producer Responsibility Organization (PRO)** – Producer Responsibility Organizations are governing bodies that have been developed by the electronics industry in a country in order to coordinate collection, financing, and other administrative functions to fulfill each producer's responsibility of facilitating an appropriate and efficient means of collection for end-of life electronics. These organizations are similar in structure to delegated organizations, but they differ as they are owned and organized by industry members.
- **Municipal Responsibility** – This governing structure is a decentralized approach to recycling. Municipal responsibility gives each municipality full control over the financing and collection of waste electronics. In the Denmark, municipalities have created larger organizations to collaborate and establish more efficient processes and practices, similar to delegated organizations, to minimize the fragmentation that has occurred.

6.6 PROGRAM SCOPE

The following table outlines the scope of each recycling program. European programs on average have more applicable products due to the WEEE Directive, while North American electronic recycling programs are smaller in scope. Two countries, The Netherlands and Switzerland have two separate programs for different product types. Table 6-3 illustrates the scope of the electronics recycling programs reviewed.

Table 6-3
Program Scope Summary

Program	IT Products and TV's	White Goods	Brown Goods	Electric Tools	Gardening Equipment	Toys or Leisure	Medical Equipment	Lighting Equipment
ERA	√							
Recupel	√	√	√	√	√			√
Denmark Tax	√	√	√	√	√	√	√	
NVMP	√*	√	√	√	√		√	
ICT Milieu	√							
El Retur	√	√	√	√	√	√	√	
El Kretsen	√	√	√	√	√	√	√	√
SWICO	√		√				√	
S.EN.S.		√		√	√	√		√
Delaware	√		√			√		
California	√*							

*includes TV's or audio/visual equipment only

6.7 FUNDING MECHANISM

There are three common financing structures that the electronic recycling programs have utilized. A product disposal levy is the most common type and is not particular to a certain governing structure. Denmark is the only scheme that utilizes a municipal tax while Delaware is the only program where landfill tipping fees are utilized for electronics recycling. Table 6-4 illustrates the financing structure for each program.

Table 6-4
Electronic Recycling Program Finance Structure

Program	Product Disposal Levy	Municipal Tax	Tipping Fee
ERA	√		
Recupel	√		
Denmark Tax		√	
NVMP	√		
ICT Milieu	√		
El Retur	√		
El Kretsen	√		
S.EN.S.	√		
SWICO	√		
Delaware			√
California	√		

- Product Disposal Levy – The most common type of program financing structure is a Product Disposal Levy, which is paid by the producer when products are entering the market or charged to the consumer at the point of sale. There are different types of calculation methods such as by weight, price, or a variable fee, but the most common type is a fixed fee. Manufacturers that are charged the product disposal levy by the electronic recycling program, charge customers in turn as these costs are passed down the supply chain to the end-user of the product.

- Municipal Tax – This tax is a fixed fee or tax per household that is paid with all other municipal taxes. This fee flows as general tax revenue for each municipality and is used to finance the municipal waste sites and any other types of collection methods offered by the municipality.

- Tipping Fee – The tipping fee is a fee charged at landfills for the disposal of various garbage or waste. As waste electronics can be dropped off free of charge in Delaware, the tipping fee for other wastes is cross-subsidized to finance the all DSWA funded recycling initiatives.

An interesting survey was conducted regarding the public view of who should be responsible for financing the recycling of waste electronics. In 2002 by the Governor's Office of Energy in Colorado published results of trial recycling programs and surveyed consumers discarding end-of-life electronics. One question was asked, "Who should pay to properly dispose of computers?" The results are illustrated in Table 6-5:

Table 6-5
Colorado Computer Recycling Collection Events

Group	Percentage
Consumer/User	35%
Manufacturer	28%
Retailer	1%
Government	3%
Shared between all	38%
Other	4%
Don't Know	0%

"The collection above was being asked at computer collection events around the country to gauge what direction any national initiatives might take. Colorado responses track with national findings."

"One note: it was not apparent to most participants that the event in which they were participating was being heavily subsidized by government funds. Had that been known, respondents may have answered differently – recognizing that without the subsidy, the community organizers would have to charge significantly higher fees."

The results indicate that the majority of respondents feel that financial responsibility falls on consumers and manufacturers, or shared between all.

6.8 RECOVERY MECHANISM

There are many options available to each program to collect waste material. All North American and European programs utilize municipal collection sites. Retail take-back options are predominantly available in European schemes; California is the only North American program to utilize the retail take-back option. Curbside collection is

scarce and usually limited due to higher costs, programs that offer this collection method charge additional fees to pick up waste electronics. Table 6-6 illustrates recovery methods for each program.

Table 6-6
Waste Electronics Program Recovery Method

Program	Municipal Collection Sites	Retail Take-Back	Limited Curbside	Producer Take-Back	Specialized Centres
ERA	√				
Recupel	√	√	√	√	√
Denmark Tax	√		√		
NVMP	√	√			√
ICT Milieu	√				
El Retur	√	√			√
El Kretsen	√	√			√
SWICO	√	√	√	√	√
S.EN.S.	√	√			√
Delaware	√		√		
California	√	√			

- Municipal Collection Sites – The most common type of collection system where consumers drop-off waste material, municipal sites are utilized due to the existing infrastructure and convenient locations. Disposal at these sites are usually free for waste electronics, with the exception of Delaware where a tipping fee is charged on all materials disposed at the landfill, except for waste electronics. The percentage of waste electronics collected at municipal sites is generally much larger than any other type of collection method.

- Retail Take-Back – Consumers can take back waste electronics to retailers, usually on a one-for-one basis however some schemes do not require purchase of new equipment. Retail take-back also includes taking end-of-life products via home delivery wherever applicable.

- Limited Curbside – Some jurisdictions offer curbside collection. This type of collection method is very limited and extra charges may apply for this service. Curbside collection is the most convenient method of collection for consumers, but the most costly to maintain.

- Producer Take-Back – Similar to Retail Take-Back, Producer Take-Back responsibilities are often from business-to-business purchases (B2B) or other commercial purchases. Due to the size and or nature of larger equipment purchased for industrial or commercial purposes, a separate system was developed to handle this large volume of products.

- Specialized Centres – These are either specialized collections sites created by the Producer Responsibility Organization (PRO) or are third party collection sites that may be remunerated for the provision of space. Specialized centres mimic municipal collection sites, but are not owned by the municipality.

6.9 KEY QUESTIONS

6.9.1 QUESTION ONE—PROGRAM EFFECTIVENESS

How does the overall effectiveness of Alberta's programs in terms of achieving mandated outcomes (material collection rates, etc) compare with programs targeting those same materials in other jurisdictions?

6.9.1.1 GOVERNANCE MODEL

The electronics recycling program in Alberta is unique in comparison to other schemes as ERA is a Delegated Administrative Organization (DAO), an Alberta made organizational model. As illustrated in Table 6-2 in the Program Characteristics Summary, PRO's govern all European programs, with the exception of Denmark. These PRO's are similar to ERA's DAO in function and structure. Both types of organizations are administrative bodies created by either a government department or members of the industry to efficiently administer the electronics recycling programs in their respective jurisdictions. Both organizations have the authority to determine program scope, financing structure, collection methods and recognized processors. The only difference between these models is members of the Board of Directors. ERA currently has representatives from the Alberta Government and industry members, while Board Members of PRO's do not have any government representation.

Result

Alberta's DAO governing structure is comparable to other European schemes. Despite the absence of EPR for electronics recycling, the ERA governance model is quite similar to European countries where all responsibility for recycling waste electronics is with industry members. PRO's were developed by industry members to fulfill their recycling responsibility at the lowest cost possible.

6.9.1.2 PROGRAM SCOPE

The Alberta Electronics Designation Regulation under the Environmental Protection and Enhancement Act has designated a small range of IT equipment, leisure electronics, and other personal electronics as products applicable for electronic recycling in Alberta. During the initial year of the electronic recycling program in Alberta, the ERA designated a portion of those applicable (computers, monitors, printers, and laptops and TV's). European schemes have initially started with much larger program scopes, including white goods, brown goods, IT and other electronic equipment. This means that larger program scopes divert more electronic waste to recycling facilities, the logistics and administration involved can potentially be much more complex at the different stages of the program due to larger volumes and the logistics of recycling different product types. Table 6-3 in the Program Characteristics Summary illustrates the scope of each electronic recycling program.

Alberta has a narrower program scope than most that includes smaller items. This will drive a smaller number of tonnes diverted from the waste stream.

Result

Due to the smaller program scope, Alberta has collected a significantly less amount of total and per capita waste electronics. The 2004-2005 ARMA Annual Report indicates that 1000 tonnes (0.31 kg per capita) have been collected during the initial six months of the program, and the website indicates that 2100 (0.66 kg per capita) tonnes have been collected from October 1, 2004 to August 31, 2005.

6.9.1.3 FINANCING STRUCTURE

The electronics recycling program in Alberta uses a fixed fee charged to customers (Advance Disposal Surcharge) to fund program costs. The fee ranges from $5 to $45 CDN and is set according to the product category being sold. With the exception of Denmark and Delaware, all other mature electronic recycling programs have either a fixed or variable fee that is passed down to the end users. Although the amounts vary depending on the scheme, product category and price of the product, the end user pays for the disposal of the product. The same ideology is applied to Denmark and Delaware where a municipal tax and tipping fees are charged respectively, again the consumers of products finance the program. These programs have determined that consumers should pay for the recycling costs of these products. There currently are no mature programs where the cost of recycling is not charged to customers.

Result

The Advance Disposal Surcharge at the point of purchase is a comparable method to fund the program and has followed industry trends. The advantages to this method are simplicity and easy identification of costs attributed to the recycling program. It is also easier for the organization to track electronic sales from the remittance forms that are completed each month by retailers and manufacturers. European schemes have a similar fee structure and use similar "declaration forms" for industry to complete and return to the organization. ERA experiences cross-subsidization of funding between product categories but no cross-subsidization to TRA or any branch of the government. European schemes have a similar structure and often cross-subsidize between products and/or product categories, but do not fund other programs through the fees that are charged. Programs that utilize a municipal tax and/or landfill tipping fees are at a disadvantage, as they cannot effectively breakdown exact funding on a per unit basis and experience cross-subsidization between electronics recycling and other programs.

6.9.1.4 COLLECTION RATES AND METHODS

During the initial six months of the electronics recycling program in Alberta, ERA collected 1,000 tonnes of waste electronics. For the period of October 1, 2004 to August 31, 2005 ERA collected 2,100 tonnes. When comparing these rates of electronic products between Alberta and other countries/jurisdictions, Alberta ranks the 2nd lowest in kilograms collected per capita (0.66 kg/person) for two reasons, 1) the program scope of ERA compared to other jurisdictions is much smaller and 2) Alberta is in the initial year of its electronic recycling program. Programs in Europe with large program scopes show greater volumes of waste electronics collected. These program scopes include larger items such as white goods (refrigerators and freezers), tools, and other household appliances.

Exhibit 6-18 compares the quantity of collected material per capita in kilograms for Alberta, against other electronic recycling programs and Exhibit 6-19 compares total tonnes collected between the electronic recycling programs.[22]

[22] Quantity of materials collected obtained from http://www.albertarecycling.ca/default.cfm. This number quantifies collected materials from October 1, 2004 to August 31, 2005. Note: data for California is for the initial six months of the program (January 01, 2005 to June 30, 2005).

Exhibit 6-18
Total Tonnes Collected per Capita

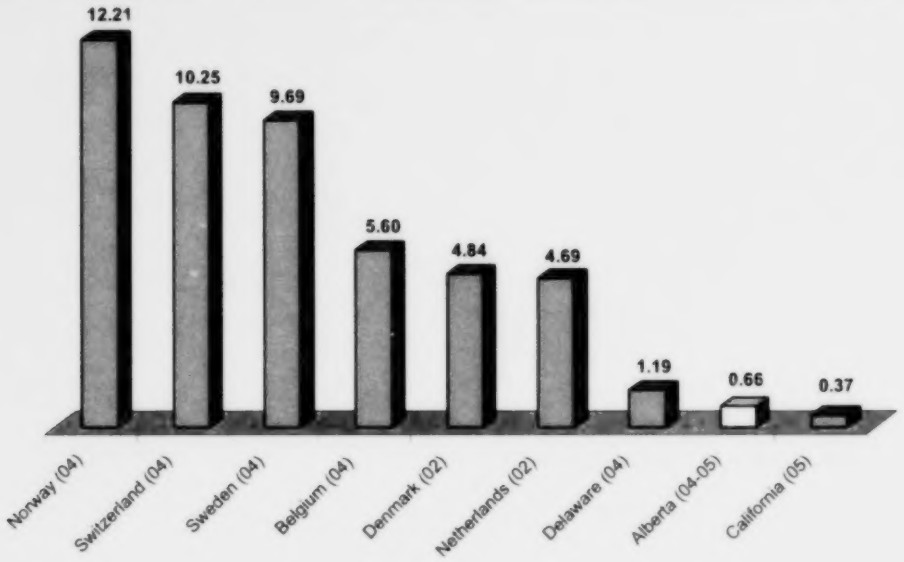
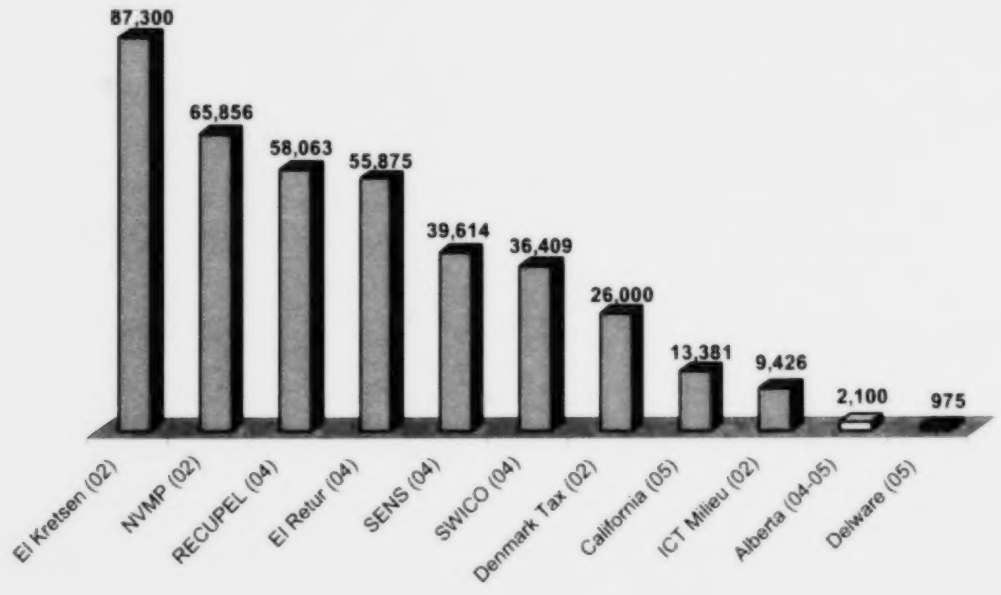


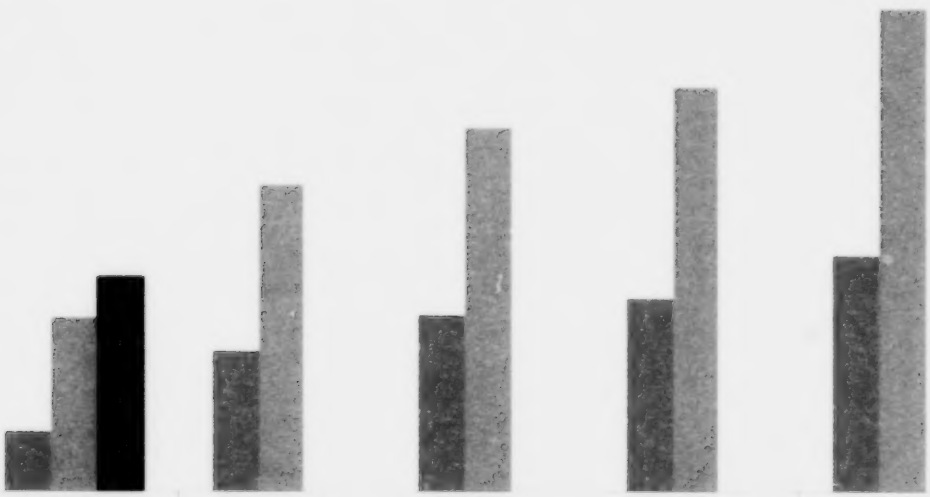
Exhibit 6-19
Total Tonnes Collected



Alberta is the 2nd lowest in total tonnage collected per year when compared to other electronic recycling programs. Alberta also has the 2nd smallest program scope, the 2nd youngest program in months operational and has the 2nd lowest population of all the compared electronic recycling programs.

In order to measure the success of Alberta's electronic recycling program, a comparison is needed between similar programs in regards to scope and the quantity of materials collected during the initial phases of each program. ICT Milieu in the Netherlands and SWICO in Switzerland have comparable program scopes and contain the products applicable with ERA, with some additions. Exhibit 6-20 compares the quantity collected per capita over the first five years of each program.

Exhibit 6-20
Quantity Collected per capita (kg) in the First 5 years of Program Implementation



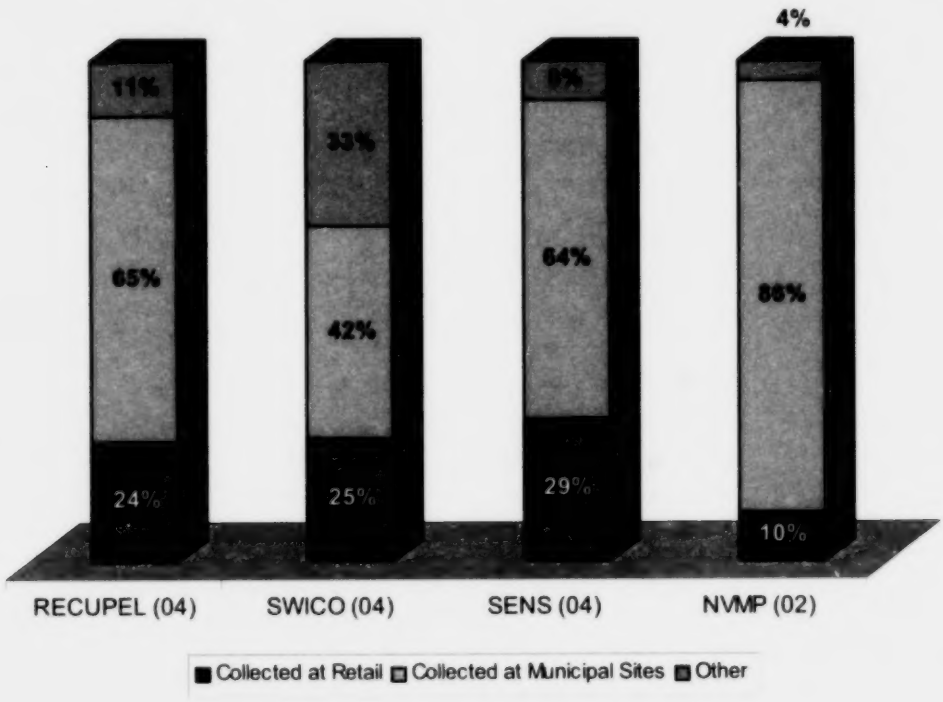
	1st Year	2nd Year	3rd Year	4th Year	5th Year
ICT Milieu	0.18	0.43	0.54	0.59	0.72
SWICO	0.53	0.94	1.12	1.24	1.48
Alberta	0.66				

When compared to SWICO and ICT Milieu, ERA has initially outperformed these two programs during the initial startup year. SWICO begun operations in 1994 and has expanded and updated the scope of the program since. ICT Milieu begun operations in 1999 and has had minimal changes to program scope.

The methods utilized by ERA to collect waste electronics are comparable to all other electronic recycling programs. Municipal waste sites are common in each program, but most European programs and California have a retail take-back system. This system provides an extra location for consumers do discard waste electronics and allow for another

form of collection for larger items that are physically difficult for consumers to transport. Belgium and Switzerland have identified recovery rates for their recovery methods and is illustrated in Exhibit 6-21.

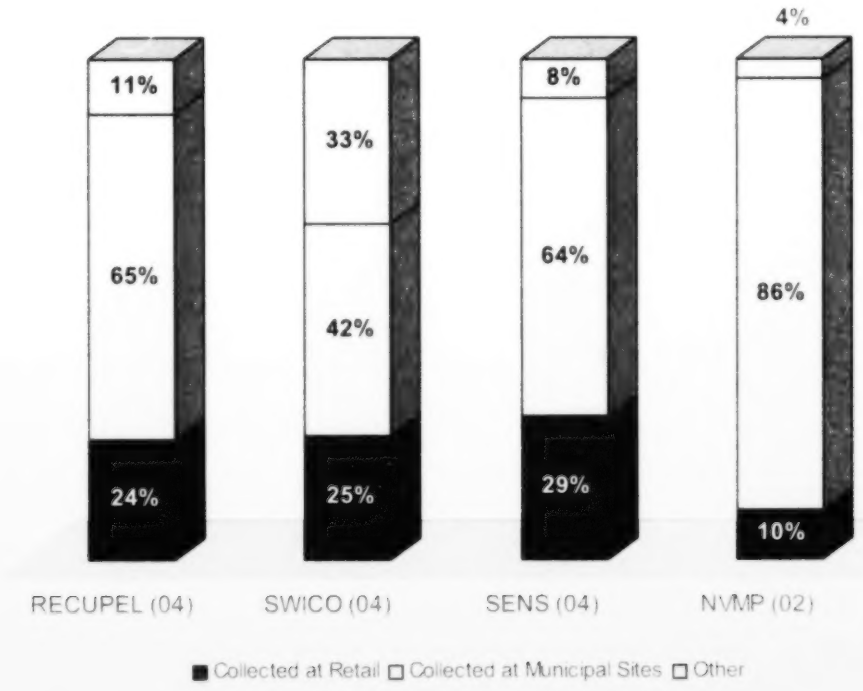
Exhibit 6-21
Recovery Rates for Each Collection Method in Belgium and Switzerland and the Netherlands



The number of municipal collection sites per capita also influences collection rates. European programs have a large number of municipal collection sites per capita and increased collection rates. Exhibit 6-22 illustrates municipal sites per capita and tonnes collected per capita.

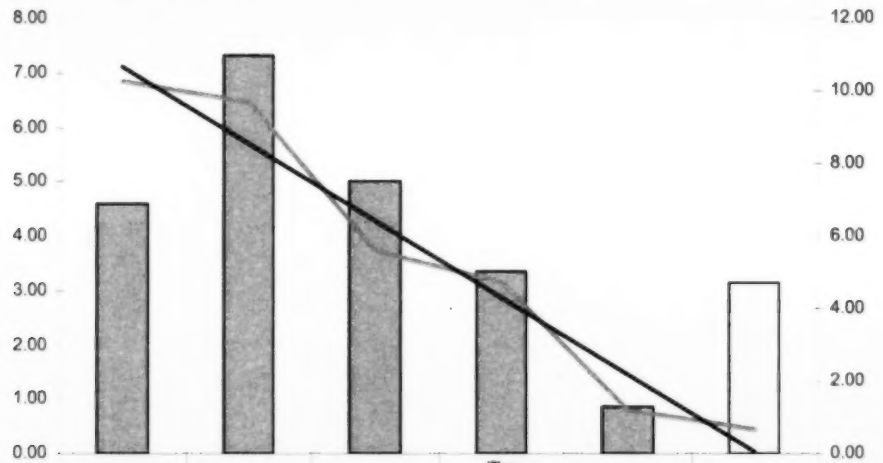
form of collection for larger items that are physically difficult for consumers to transport. Belgium and Switzerland have identified recovery rates for their recovery methods and is illustrated in Exhibit 6-21.

Exhibit 6-21
Recovery Rates for Each Collection Method in Belgium and Switzerland and the Netherlands



The number of municipal collection sites per capita also influences collection rates. European programs have a large number of municipal collection sites per capita and increased collection rates. Exhibit 6-22 illustrates municipal sites per capita and tonnes collected per capita.

Exhibit 6-22
Municipal Collection Sites and Quantity Collected (kg) per capita



	Switzerland (04)	Sweden (04)	Belgium (04)	The Netherlands (02)	Delaware (04)	Alberta (04-05)
Municipal Collection Sites per 100,000 people	4.59	7.32	5.00	3.36	0.86	3.14
Collected per capita (kg)	10.25	9.69	5.60	4.69	1.19	0.66

European programs realize higher collection rates when more municipal sites exist. Alberta has an inflated number of sites per capita due to rural areas with low population densities and a municipal waste site. Edmonton and Calgary combined have a population of 1.67 million people totalling 52.4% of Alberta's population and account for three of the 100 municipal collections sites that accept waste electronics. This calculates as 0.18 sites per 100,000 people in Edmonton and Calgary. This low number of collection sites per capita in a highly dense population is a deterrent to collection for waste electronics, as consumers do not have convenient means of disposal.

Result

The 2,100 tonnes collected by ERA during the first eleven months of the program exceeds per capita tonnage collected by ICT Milieu and SWICO in their initial year. Recycle Delaware showed a slight increase from the 3rd to 4th year of the program and has not provided data for the first two years. For the first year, quantity collected by ERA has outperformed ICT Milieu and SWICO on a per-capita basis. This indicates that ERA has had initial success with electronics recycling in Alberta with respect to program scope and per capita recovery during the first year. The utilization of collection sites as the primary collection method is comparable to other electronic recycling programs.

6.9.2 QUESTION TWO—FINANCIAL COSTS

How are the financial costs attributable to achieving mandated outcomes of Alberta's programs and how does this compare (on a cost-effectiveness basis) with the programs in other jurisdictions?

The 2004-2005 ARMA Annual Report does not indicate any financial performance targets or measures. It states,

> *"ARMA's programs are designed to encourage the development of a viable recycling industry as the best way to achieve a sustainable solution to the challenges of Alberta's designated materials,"*

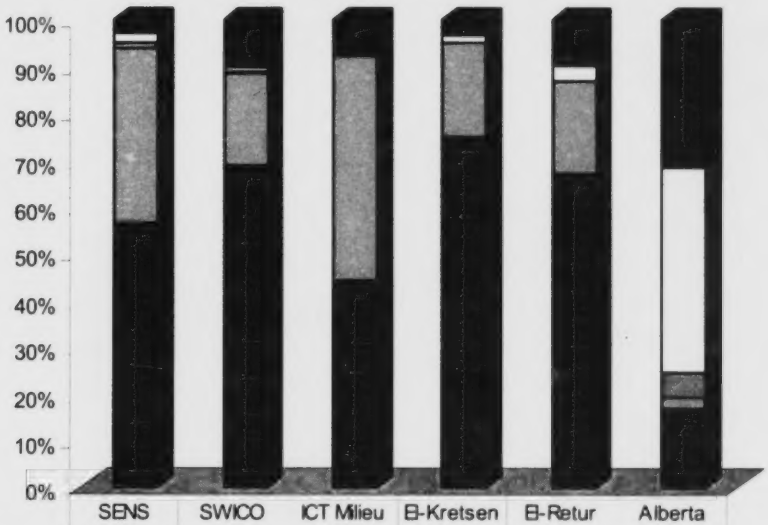
and

> *"ARMA's strategies are directly aligned to the mission, core business and waste minimization goals of Alberta Environment and the Government of Alberta."*[23]

[23] 2004-2005 ARMA Annual Report

Based on financial data provided in ERA's Annual Report, ERA has a higher total cost per kilogram than the other established programs. ERA collected 1,000 tonnes of waste electronics during the initial six-months of the electronics recycling program and had incurred one-time program start-up costs that are not applicable to the other mature programs. ERA spent a large percentage of total costs on Public Information (26% or $710,988) and Recycling Program Delivery (35% or $981,392) and thus has nearly four times the total costs per kg compared to the 2nd highest program. A cost performance comparison would be better conducted with collection and financial data for the 2nd full year of the program as extra start-up costs would not be incurred the financial data would better indicate program performance in regards to cost. The financial performance breakdown is illustrated in Exhibit 6-23.

Exhibit 6-23
Financial Performance Breakdown of Waste Electronic Programs

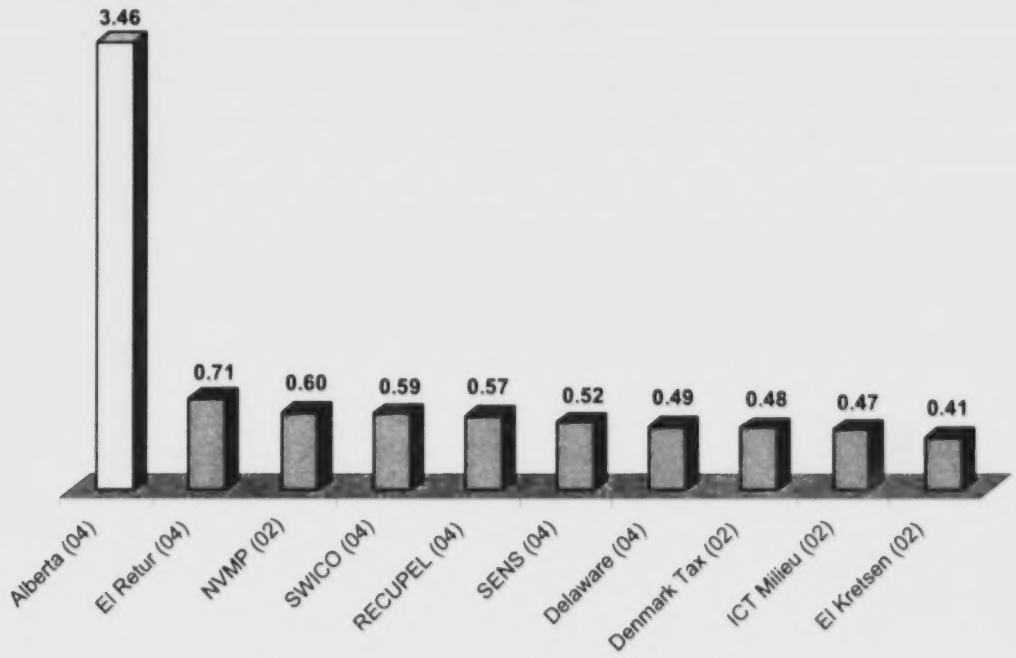


	SENS	SWICO	ICT Milieu	El-Kretsen	El-Retur	Alberta
Other	0.4%	7.7%	3.8%	0.0%	3.0%	0.0%
Admin	2.6%	2.7%	3.8%	3.5%	7.0%	31.7%
Public Relations	1.9%	0.5%	0.3%	1.5%	3.0%	43.8%
Inspections	1.3%	0.7%	0.0%	0.0%	0.0%	5.2%
Logistics	37.2%	19.4%	47.8%	20.0%	20.0%	2.3%
Recycling	56.6%	69.0%	44.5%	75.0%	67.0%	17.0%

Exhibit 6-24 compares total costs per kilogram for each program in Canadian Dollars and is adjusted for Purchasing Power Parity (PPP) for each applicable country, currency and year of data. Purchasing power parity (PPP) is a theory of exchange rate determination and a way to compare the average costs of goods and services between countries. The theory assumes that the actions of importers and exporters, motivated by cross-country price differences, induce changes in the spot exchange rate. In another vein, PPP suggests that transactions on a country's current account, affect the value of the exchange rate on the foreign exchange market. This contrasts with the interest rate parity theory that assumes that the actions of investors, whose transactions are recorded on the capital account, induce changes in the exchange rate.[24]

The rational for the PPP methodology is to reflect real costs incurred by agents operating in those jurisdictions that are subject to substantially higher costs than those in Canada, and cannot be accurately reflected by simple exchange rate averages. Using the PPP index is a widely accepted practise when comparing jurisdictions in international context and is published annually by the World Bank and the Penn World Table. The table used by this study is detailed in Appendix F.

Exhibit 6-24
Total Program Costs per kg

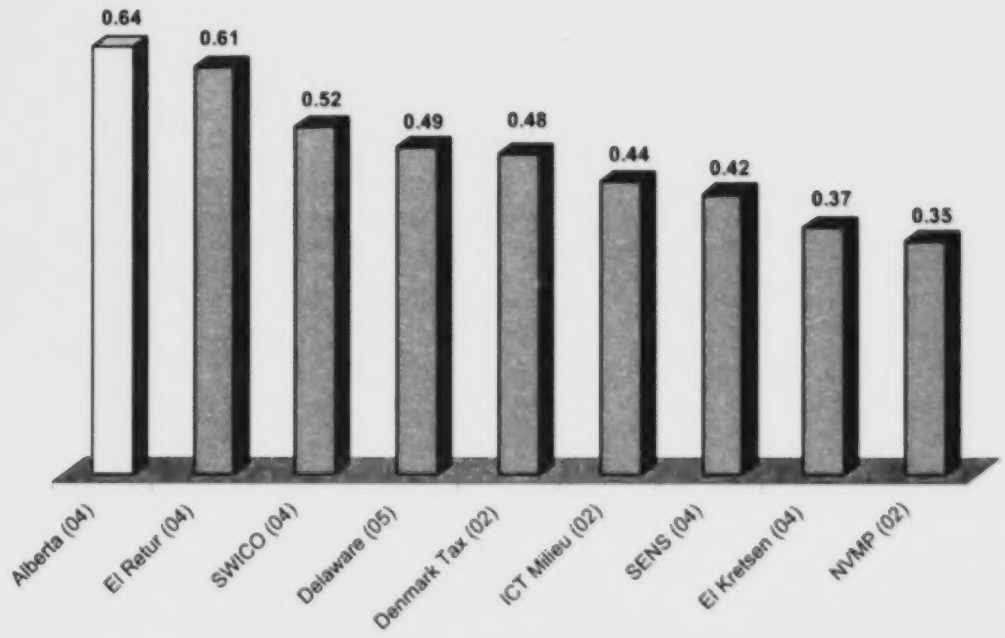


Even though Alberta has a smaller program scope and a significant difference in tonnage collected, the cost of transportation and recycling are comparative to the other programs. Factors that affect recycling and transportation costs are the total area of the jurisdiction, transportation infrastructure, negotiated recycling rates, and economies of

[24] http://internationalecon.com/v1.0/Finance/ch30/30c010.html

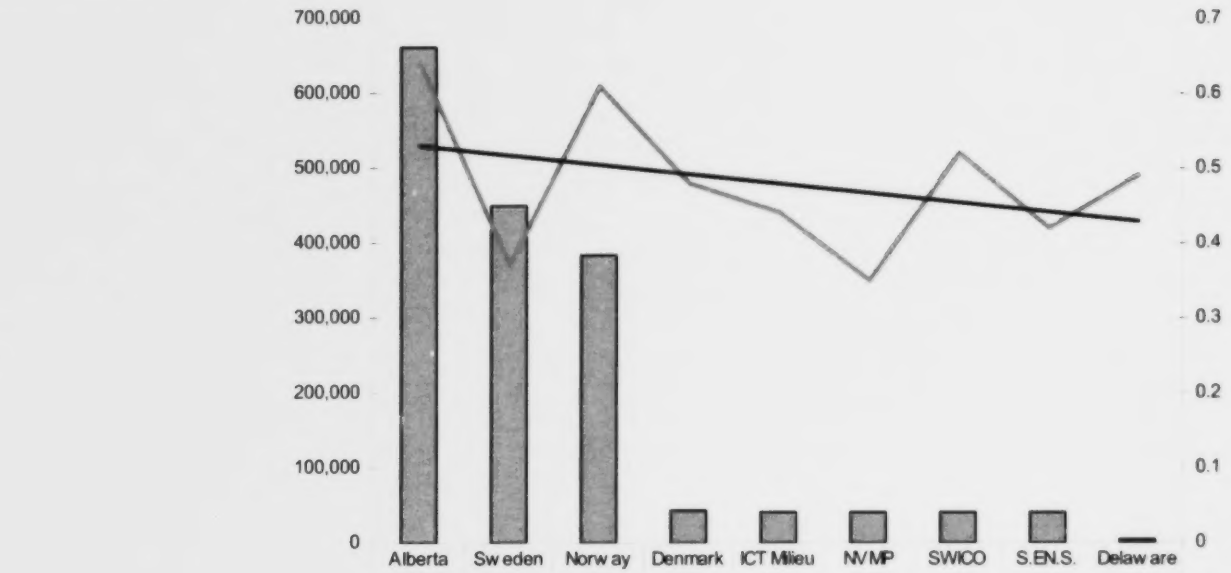
scale. Processing organizations are paid $700 per tonne for processing and $50 - $200 for collection depending on location. Due to timing differences between tonnages collected and processed, the $0.64 per kg (or $640 per tonne) cost for transportation and processing will be lower than the $700+ per tonne remunerated to processors. Exhibit 6-25 compares each scheme in Canadian Dollars (adjusted for PPP) for each applicable program.

Exhibit 6-25
Direct Processing and Transportation Costs ($ per kg)



Geography does have an apparent effect on processing and transportation cost. While variances in efficiencies of both processing and transportation exist, area in square km compared to total processing and transportation costs show a slight decrease per kg of waste electronics collected in smaller jurisdictions. All processors registered with ERA are located within the Edmonton-Calgary corridor and it is estimated that in the year 2001, 72% (2,150,000) of Alberta's population live in this centralized area.[25] Other larger urban centres such as Fort McMurray, Grande Prairie, Medicine Hat, and Lethbridge are a significant distance outside this area. As illustrated in Exhibit 6-26, direct recycling and transportation costs decrease as area of each jurisdiction decreases. This data shows a trend has developed due to the large jurisdictional area of Alberta and higher costs for transportation. Note, some jurisdictions do not break down recycling and transportation costs separately therefore these costs were combined when analyzing data.

Exhibit 6-26
Direct Recycling and Transportation Costs (per kg) Compared to Jurisdictional Area (square km)

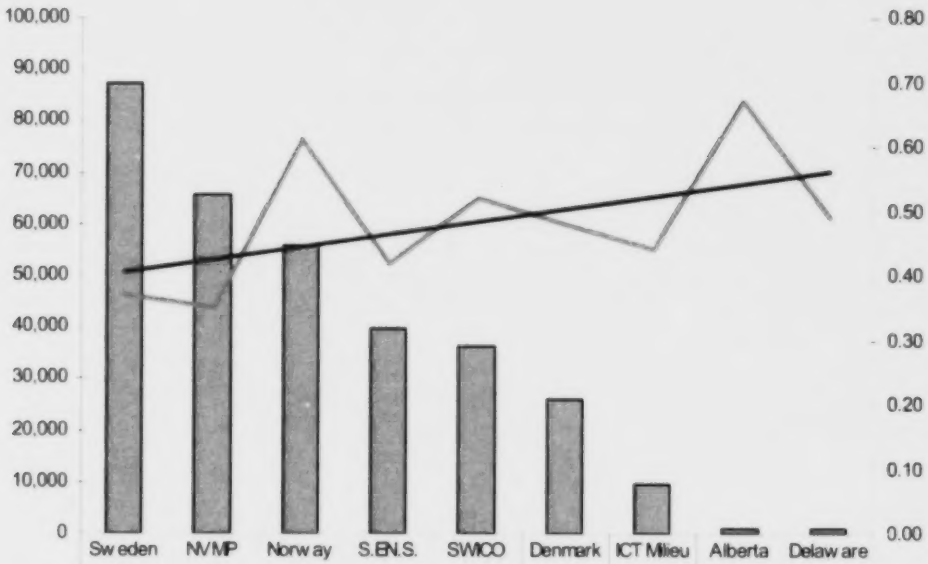


	Alberta (04-05)	Sweden (04)	Norway (04)	Denmark (02)	ICT Milieu (02)	NVMP (02)	SWICO (04)	S.EN.S. (04)	Delaware (04)
Square km	661,190	449,964	385,199	43,094	41,526	41,526	41,285	41,285	5,068
Direct Recycling and Transport Costs ($/kg)	0.64	0.37	0.61	0.48	0.44	0.35	0.52	0.42	0.49

[25] http://geodepot.statcan.ca/Diss/Highlights/Page9/Page9d_e.cfm

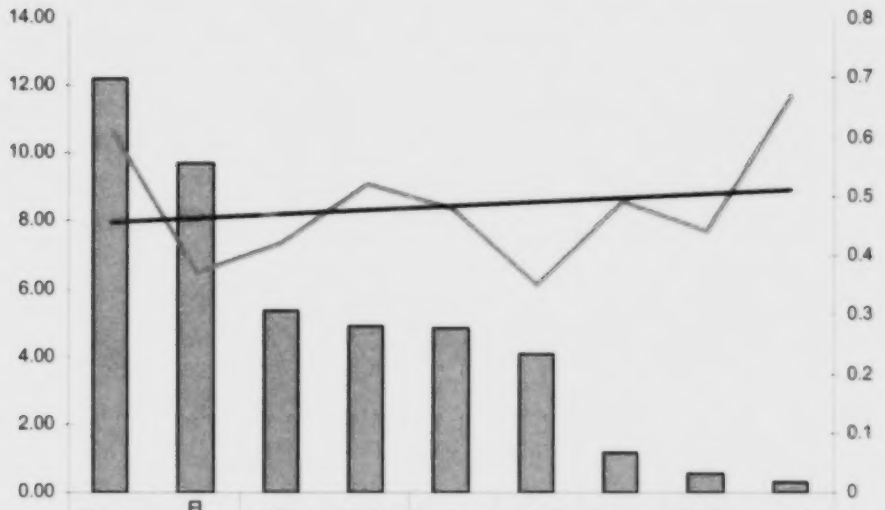
As tonnage of collected and recycled waste electronics decreases, direct transportation and recycling costs increase. This illustrates economies of scale and how programs with a smaller scope and tonnage collected may incur greater costs per kg collected. Programs with a larger product scope have increased tonnage collected and can realize greater economies of scale when compared to programs with a smaller program scope and lower tonnes collected. Exhibit 6-27 depicts total tonnage collected against direct recycling and transportation costs and Exhibit 6-28 depicts quantity of tonnes collected per capita against direct processing and transportation costs.

Exhibit 6-27
Direct Processing and Transportation Costs (per kg) Compared to Tonnes Collected



	Sweden (04)	NVMP (02)	Norway (04)	S.EN.S. (04)	SWICO (04)	Denmark (02)	ICT Milieu (02)	Alberta (04)	Delaware (04)
Quantity Collected (tonnes)	87,300	65,856	55,875	39,614	36,409	26,000	9,426	1,000	975
Direct Recycling and Transport Costs ($/kg)	0.37	0.35	0.61	0.42	0.52	0.48	0.44	0.67	0.49

Exhibit 6-28
Direct Processing and Transportation Costs (per kg) Compared to Tonnes Collected per Capita



	⊟ Retur (04)	⊟ Kretsen (04)	SENS (04)	SWICO (04)	Denmark Tax (02)	NVMP (02)	Delw are (05)	ICT Milieu (02)	Alberta (04)
Quantity Collected per capita (kg)	12.21	9.69	5.34	4.91	4.84	4.10	1.19	0.59	0.31
Direct Recycling and Transport Costs ($/kg)	0.61	0.37	0.42	0.52	0.48	0.35	0.49	0.44	0.67

Result

A lesser Economies of scale on direct recycling and transportation costs exist. Total tonnage collected has more of an effect on direct processing and transportation costs that quantity collected per capita. In order to reduce overall transportation and processing costs per tonne, a larger quantity of tonnes will need to be collected.

6.9.3 QUESTION THREE—DISPOSITION OF RECYCLED MATERIALS

How do the Alberta programs compare with programs in other jurisdictions in terms of the disposition of collected materials (i.e. volumes and/or rates of collected materials that are re-used and recycled)?

The definition of processing waste electronics varies among different schemes and jurisdictions. Industry practice identifies recycling as material not destined for landfill, incineration, or energy recovery. ERA does not deviate from common industry practice as it distinguishes between materials reused or recycled into other products, materials that

are incinerated for energy or non-energy purposes, and materials that enter landfills or other waste disposal sites. Table 6-8 illustrates ERA's recycling performance as indicated by ARMA.

Table 6-8
ERA Recycling Performance

End Use	Percentage
Recycled	90.91%
Incinerated (Energy)	5.04%
Incinerated (Waste)	0%
Landfill	4.04%

Metals and plastics compose of the most processed material for the electronics recycling program in Alberta. These two materials have value on the open market that provides incentive for processors to retain as much of these materials as possible, the alternatives being incineration and/or diversion to a landfill.

Process
An example of an Alberta recycling process is demonstrated by Ecycle Solutions. They have integrated a low cost, high recovery reycling processes developed in Germany and is as follows:

1) Products are loaded onto a hopper which feeds into a mechanical separator. These products are sprayed with a dust supression foam spray before entering the separator.

2) The mechanical separator shreds the products into large pieces, which then travel to a magnetic conveyer belt which separates steel from all other materials.

3) Non-metal products are then manually sorted by employees into the following categories:

   i. High Grade Circuit Boards
   ii. Low Grade Circuit Boards
   iii. Sorted Plastic
   iv. Clean and Mixed Aluminum
   v. Clean and Mixed Copper
   vi. Nickel
   vii. Rechargeable Batteries
   viii. Printer Toner Cartriges
   ix. Wood

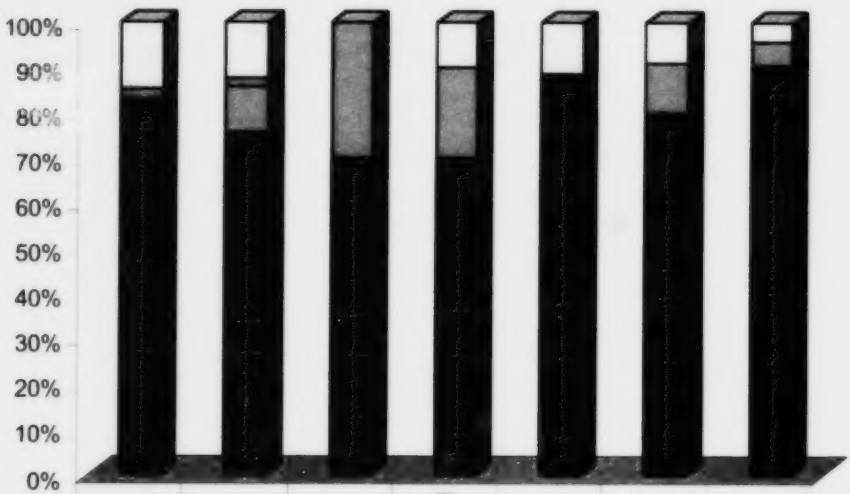
x. Mercury Switches
xi. Mixed Plastic and Low Grade Circuit Boards
xii. Mixed CRT Glass
xiii. Low Grade Shredded E-Waste

4) Each category of sorted products is then processed and packaged for the end-use recycler. The commodities are sold to various companies located in Belgium, California, Washington and Alberta.

The entire process is illustrated in Appendix M.

All European schemes process 70% or more of the waste electronics collected. The remaining material is incinerated, used as fuel or energy creation, or diverted to landfills. [26] Exhibit 6-29 compares recycling performance between Alberta and other jurisdictions.

Exhibit 6-29
Electronic Recycling Performance by Jurisdiction



	Recupel (04)	⊟ Retur (04)	SWICO (04)	⊟ Kretsen (02)	ICT Milieu (02)	Denmark (02)	Alberta (05)
☐ Landfill	14.38%	12.00%	0.00%	10.00%	11.00%	9.00%	4.04%
■ Incineration (Waste)	2.31%	2.00%	0.00%	0.00%	0.00%	0.00%	0.00%
■ Incineration (Energy)	0.00%	10.00%	29.60%	20.00%	0.00%	11.00%	5.04%
■ Recycled	83.31%	76.00%	70.40%	70.00%	89.00%	80.00%	90.91%

[26] This process burns or combusts the waste material for energy creation in smelters and other industrial applications.

End Use

Materials identified as recycled are sold on the open market to vendors that in turn use the materials for new products or other processes. An example of materials and end-uses is summarized in Table 6-9.

Table 6-9
Examples of Material End Use and Final Recycled State

Material	Sub Vendor Basic Process	Final Recycled State	End Use
Plastic	Recompound and Pelletize	Resin Pellets	New Products
Printed Circuit Boards	Smelting for metal recovery and energy recovery	Precious metals and energy recovery	Commodity and energy
Wire	Wire chopping	Copper chop and PVC Sheathing	Commodity and landfill
Frames	Smelting	Steel	Commodity
Components	Shredding	Steel and non-ferrous metal mix	Commodity
Polarized Yolk	Wire chopping	Copper chop and PVC Sheathing	Commodity and landfill
CRT Glass	Cleaning and export	Glass	Commodity
Platen Glass	Sort and size reduce	Fibreglass Insulation	Commodity
Toner Cartridge	Disposal	Disposal	Landfill

Result

Alberta is a leader when comparing recycling performance between all other jurisdictions. When compared to a similar program, ICT Milieu, ERA's recycling performance is comparable given the program scope and the discrepancy of current information. One major difference between the two is that ICT Milieu has policies that prohibit incineration, which means materials are either recycled or sent to landfills and not burned. Although incineration is not considered recycling, the common application of this end-use by each jurisdiction diverts more materials away from landfills or other solid waste disposal sites.

6.9.4 QUESTION FOUR—APPROPRIATE AND EFFECTIVE MECHANISMS IN ALBERTA

Are the most appropriate and efficient mechanisms being employed to achieve program objectives in Alberta?

Although ERA has not defined specific objectives for the electronic recycling program, mechanisms throughout the other program schemes and their results can be compared to the current mechanisms in Alberta.

- **Governance** – Alberta's DAO Governance Structure is an effective mechanism to administer the electronics recycling program. The DAO is comparable to PRO's who are efficient organizations that administer their respective recycling programs on a lowest cost possible basis. Industry members in Sweden (the birthplace of EPR) believe PRO's (e.g. El Kretsen in Sweden) are more efficient because one large organization handles program administration rather than many decentralized manufacturers and retailers.

- **Program Scope** – Alberta electronics recycling does not have a sufficiently broad scope to effectively divert maximum tonnage of waste electronics to processing facilities. This also creates lesser economies of scale and increases costs per kilogram of material collected. An effective mechanism would be to increase program scope to include products with larger mass, thereby lowering program costs per tonne and reduce overall waste.

  White goods are important to any recycling program due to their higher metal content and mass. In a recent study, Waste Division Ontario (WDO) has identified the allocation of white goods compared to other electronic products entering the waste stream (illustrated in Table 6-10). Alberta and Ontario are demographically similar and the breakdown of goods entering the waste stream may be comparable, but actual volumes differ due to the population variances.[27]

Table 6-10
Volumes of Electronic Goods Sold in Ontario in 2004

	Units Sold	% of Units	Tonnes Sold	% of Tonnes
White Goods	2,485	11%	146,163	56%
Portables and Floor Care	6,421	30%	24,518	9%
IT Equipment	1,783	8%	23,203	9%
Telecommunications Equipment	4,208	19%	1,307	1%
Audio-Visual Equipment	6,813	31%	63,695	25%
Total	**21,710**	**100%**	**258,886**	**100%**

White goods represent 56% of waste electronics entering the waste stream in Ontario. The narrow scope of the ERA program has not targeted these products, which also contribute to Alberta's electronic waste stream.

[27] http://webservices.siriusweblabs.com/dotconnector/files/domain4116/WEEE%20Study%20Report.pdf

- **Financing** – ERA employs an Advance Disposal Surcharge to finance program costs. Compared to other successful schemes, a visible fixed fee is most effective for administrative purposes and promotes consumer awareness when compared to non-visible, variable or a multiple fee structure. Also, a segregated financial structure such as ERA does not create the confusion regarding funding sources or cross-subsidization that is common to programs with tipping fees or municipal taxes.

- **Collection** – ERA utilizes municipal waste sites, which are the most efficient collection method. This mechanism utilizes existing infrastructure in order to establish collection points across Alberta. Electronic recycling schemes in both North America and Europe use this collection method.

- **Processing** – Ecycle Solutions recycling rate of 84% exceeds data provided by all other jurisdictions with the exception of ICT Milieu. This rate also exceeds the minimum standards set for by the WEEE Directive and would be compliant if similar legislation were adopted in North America.

6.9.5 QUESTION FIVE—LEADING PRACTICES

Are there examples of best practices or innovative approach to waste stewardship that can be identified from this analysis that would be appropriate for consideration in Alberta?

- Scope – Alberta has a narrow scope for electronic waste collection when compared to other established electronic recycling schemes. The applicable products do not effectively reduce waste tonnage. European schemes have incorporated a very broad product scope in order to divert the most tonnage of materials to processors and in order to be more environmentally responsible at the lowest cost per tonne possible. Introducing a wider range of applicable electronic equipment for recycling can reduce costs per tonne due to economies of scale and divert more waste from landfills to recycling facilities.

- Collection – Alberta does not have a retail take-back option in place. Larger Alberta retailers not only supply the majority of electronics in Alberta, but may also have the funding and internal infrastructure to incorporate a return-to-retail model. The opportunity exists for ERA to increase tonnage collected with a proper retail take-back system.

- In conjunction with the above leading practice, there must be an incentive for retailers to collect as much waste electronics as possible. Some European schemes have incorporated administrative reimbursements due to the financial burdens manufacturers and retailers endure. Introducing reimbursements can increase compliance and lower retailer dissention for those unwilling to participate.

- Minimum Standards for municipal sites – Many European schemes have minimum standards for municipal sites. These include uniform bins, minimum amounts of storage space, and proper signage at each facility. These standards promote awareness, allow for sorting of the products at the point of disposal if needed, and secure proper space for storage.

In conjunction with the above leading practice, European programs utilize a larger number of municipal and other waste collection sites per capita in metropolitan areas that produce a higher number of collection sites per capita and realize increased collection rates of waste electronics.

- Transparency – Effective and timely information is critical to a successful recycling scheme. ERA has an opportunity to outperform other programs by utilizing effective and timely reporting methods. European annual reports focus on tonnage collected as recycling performance. The detail of financial reporting is limited and very little information exists as to the results of internal recycling audits. Success of the program will result from critical, accurate and timely information from ERA such as recovery and collection rates.

7 APPENDICES

APPENDIX A

ALBERTA HANDLING COMMISSION RATES (2005)

APPENDIX A – ALBERTA HANDLING COMMISSION RATES (2005)

Appendix A outlines deposits and recycling fees imposed in Alberta in 2005

Container Type	¢ / unit	¢ / dozen
Aluminum 0 - 1 Litre	2.80	33.60
PET Over 1 Litre	7.50	90.00
PET 0 - 1 Litre	5.54	66.48
HDPE Over 1 Litre	8.00	96.00
HDPE 0 - 1 Litre	8.00	96.00
PVC Over 1 Litre	8.00	96.00
PVC 0 - 1 Litre	8.00	96.00
Polystyrene Cups 0 - 1 L	8.00	96.00
Glass 0 - 500 ml	7.18	86.16
Glass 501 - 1 Litre	8.00	96.00
Glass Over 1 Litre	8.00	96.00
Ceramics 0 - 1 Litre	8.00	96.00
PVC Plastic Over 1 Litre	8.00	96.00
PVC Plastic 0 - 1 Litre	8.00	96.00
Polypropylene Over 1 Litre	8.00	96.00
Polypropylene 0 - 1 Litre	8.00	96.00
Tetra Brik Over 1 Litre	8.00	96.00
Tetra Brik 0 - 1 Litre	5.30	63.60
Gable Top Over 1 Litre	8.00	96.00
Gable Top 0 - 1 Litre	8.00	96.00
Bi-Metal Over 1 Litre	8.00	96.00
Bi-Metal 0 - 1 Litre	8.00	96.00
Drink Pouches 0 - 1 L	8.00	96.00
Aerosol 0 - 1 Litre	8.00	96.00
Bag-in-a-box	8.00	96.00
Liquor / Wine Ceramics	8.00	96.00
Beer Cans	2.83	34.00
Beer Bottles	2.83	34.00

APPENDIX B

ALBERTA DEPOSIT AND CONTAINER RECYCLING FEE RATES (2005)

APPENDIX B –ALBERTA DEPOSIT AND CONTAINER RECYCLING FEE RATES (2005)

Appendix B details the deposit levels and container recycling fee amounts by container type in 2005. These are paid by consumers at the point of purchase.

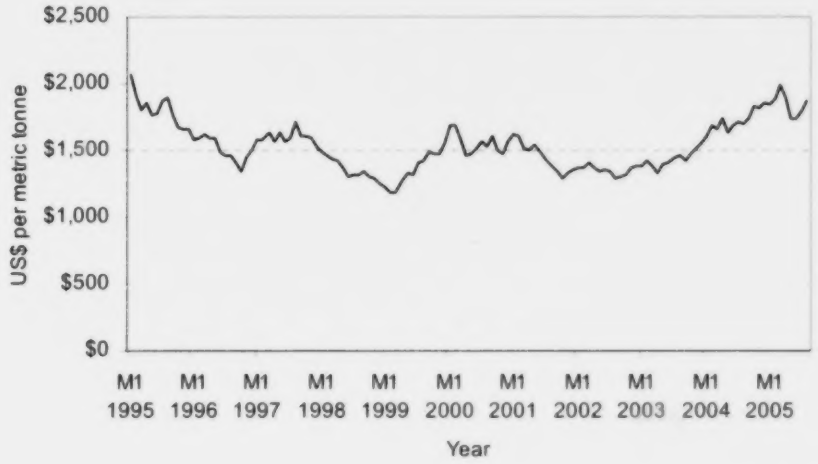
Container Type	Size	Refundable Deposit	Container Recycling Fee	Total Fee
Aluminium	1L & less	5¢	0¢	5¢
Aerosol	1L & less	5¢	8¢	13¢
Plastic PET	1L & less	5¢	2¢	7¢
Plastic PET	Over 1L	20¢	5¢	25¢
Plastic HDPE/PVC	1L & less	5¢	6¢	11¢
Plastic HDPE/PVC	Over 1L	20¢	3¢	23¢
Polystyrene Cups	1L & less	5¢	3¢	8¢
Glass	0-500ml	5¢	6¢	11¢
Glass	501ml-1L	5¢	8¢	13¢
Glass	Over 1L	20¢	10¢	30¢
Tetra Brik	1L & less	5¢	2¢	7¢
Tetra Brik	Over 1L	20¢	1¢	21¢
Gable Top	1L & less	5¢	2¢	7¢
Gable Top	Over 1L	20¢	0¢	20¢
Drink Pouches	1L & less	5¢	2¢	7¢
Bag-In-A-Box	Over 1L	20¢	0¢	20¢
Bi-metal	1L & less	5¢	4¢	9¢
Bi-metal	Over 1L	20¢	0¢	20¢
Aluminium (Beer)	1L & less	10¢	1.21¢	11.21¢
Aluminium (Beer)	Over 1L	10¢	0¢	10¢
Refillable Glass (Beer)	1L & less	10¢	5.92¢	15.92¢
Glass (Imported Beer)	1L & less	10¢	2¢	12¢
Glass (Imported Beer)	Over 1L	10¢	10¢	20¢
Plastic (Beer)	1L & less	10¢	2¢	12¢
Plastic (Beer)	Over 1L	10¢	6¢	16¢

APPENDIX C

HISTORICAL PRICE OF ALUMINUM

APPENDIX C – HISTORICAL PRICE OF ALUMINIUM

Appendix C tracks the historical price of aluminium between January 1995 and October 2005.



APPENDIX D

STEWARDSHIP ONTARIO & PACKING FEE SCHEDULE (2003 – 2005)

APPENDIX D – STEWARDSHIP ONTARIO PAPER & PACKAGING FEE SCHEDULE (2003-2005)

Appendix D illustrates the fee schedule imposed on member organizations based on the weight of materials sold into the market place.

Category	2003 Fee Rate (¢/kg)	2003 Fee Rate (¢/kg)	2003 Fee Rate (¢/kg)
Printed Paper			
Newsprint	0.028	0.026	0.271
Newsprint - Non CNA/OCNA	0.028	0.026	0.786
Magazines and catalogues	0.081	0.31	0.862
Telephone books	0.081	0.687	1.302
Other printed paper	0.251	1.318	9.029
Packaging			
Paper based packaging	4.728	5.987	7.904
Plastics packaging	6.692	9.61	13.907
Steel packaging	3.633	4.391	4.745
Aluminium cans	-5.465	-3.193	-1.093
Foil & other aluminium	-5.465	-3.193	5.502
Clear glass packaging	3.723	3.682	3.761
Colour glass packaging	4.016	3.916	4.432

APPENDIX E

SCANDINAVIAN NON-REFILLABLE DEPOSIT PRORAM COMPARISON

APPENDIX E – SCANDINAVIAN NON-REFILLABLE DEPOSIT PROGRAM COMPARASON

Norway		Aluminum	Aluminum	PET	PET
	Units Sold	198,900,000	198,900,000	61,900,000	61,900,000
	Return Rate	92%	92%	78%	78%
	Units Recovered	**182,988,000**	**182,988,000**	**48,282,000**	**48,282,000**
		NOK	$CDN	NOK	$CDN
	Administrative fee from producers and importers	34,085,000	$4,895,498	22,195,000	$3,187,783
	Deposit revenues from consumers via producers and importers	198,938,000	$28,572,701	104,323,000	$14,983,512
	Sale of collected material to recyclers	28,151,000	$4,043,220	1,962,000	$281,795
	Other operating revenues	1,987,000	$285,385	1,324,000	$190,161
	Total Operating Revenues	**263,161,000**	**$37,796,804**	**129,804,000**	**$18,643,250**
	Deposits refunded to consumers	180,874,000	$25,978,238	82,479,000	$11,846,142
	Handling fee to receiving locations	31,049,000	$4,459,449	10,041,000	$1,442,150
	Transport costs	23,130,000	$3,322,073	11,653,000	$1,673,676
	Other operating costs	7,336,000	$1,053,642	3,352,000	$481,435
	Administration, marketing and depreciation	23,638,000	$3,395,035	16,621,000	$2,387,210
	Total Operating Costs	**266,027,000**	**$38,208,436**	**124,146,000**	**$17,830,613**
	Excess of Revenues over Expenses	**(2,866,000)**	**($411,633)**	**5,658,000**	**$812,637**
Alberta		Aluminum	Aluminum	Plastic	Plastic
	Units Sold	478,279,000	478,279,000	320,199,586	320,199,586
	Return Rate	80.6%	80.6%	70.1%	70.1%
	Units Recovered	**385,454,619**	**385,454,619**	**224,338,585**	**224,338,585**
		NOK	$CDN	NOK	$CDN
	Regulated Deposits	$166,388,213	$23,897,700	$183,956,739	$26,421,000
	Container Recovery Fee	$31,385,647	$4,507,800	$65,693,464	$9,435,300
	Operating Income	$69,953,134	$10,047,100	$26,616,321	$3,822,800
	Total Operating Revenues	**$267,726,994**	**$38,452,600**	**$276,266,525**	**$39,679,100**
	Regulatory Transfers to BCMB	$1,207,997	$173,500	$715,051	$102,700
	Deposits Refunded to Depots	$133,729,817	$19,207,100	$140,828,802	$20,226,700
	Handling Commissions paid to Depots	$74,887,472	$10,755,800	$96,565,974	$13,869,400
	Transportation	$6,507,171	$934,600	$7,830,050	$1,124,600
	Processing	$5,547,040	$796,700	$11,385,809	$1,635,300
	Administration	$5,876,367	$844,000	$3,757,672	$539,700
	Advertising & System Development	$981,715	$141,000	$3,499,363	$502,600
	Total Operating Costs	**$228,737,579**	**$32,852,700**	**$264,582,720**	**$38,001,000**
	Excess of Revenues over Expenses	**$38,989,415**	**$5,599,900**	**$11,683,805**	**$1,678,100**

Sweden		Aluminum	Aluminum	PET	PET
	Units Sold	914,000,000	914,000,000	365,000,000	365,000,000
	Return Rate	85%	85%	78%	78%
	Units Recovered	**773,000,000**	**773,000,000**	**283,000,000**	**283,000,000**
		EURO	$CDN	EURO	$CDN
	Administrative fee from producers and importers	-	$0	19,440,000	$23,201,017
	Deposit revenues from consumers via producers and importers	45,240,000	$53,992,491	50,400,000	$60,150,785
	Sale of collected material to recyclers	12,760,000	$15,228,651	2,160,000	$2,577,891
	Other operating revenues	-	$0	-	$0
	Total Operating Revenues	**58,000,000**	**$69,221,142**	**72,000,000**	**$85,929,693**
	Deposits refunded to consumers via receiving locations	34,220,000	$40,840,474	40,600,000	$48,454,799
	Handling fee to receiving locations	16,240,000	$19,381,920	24,500,000	$29,239,965
	Transport costs	1,160,000	$1,384,423	1,400,000	$1,670,855
	Other operating costs	-	$0	-	$0
	Administration, marketing and depreciation	6,380,000	$7,614,326	3,500,000	$4,177,138
	Total Operating Costs	**58,000,000**	**$69,221,142**	**70,000,000**	**$83,542,757**
	Excess of Revenues over Expenses	-	**$0**	**2,000,000**	**$2,386,936**
Alberta		Aluminum	Aluminum	Plastic	Plastic
	Units Sold	478,279,000	478,279,000	320,199,586	320,199,586
	Return Rate	80.6%	80.6%	70.1%	70.1%
	Units Recovered	**385,454,619**	**385,454,619**	**224,338,585**	**224,338,585**
		EURO	$CDN	EURO	$CDN
	Regulated Deposits	$20,023,747	$23,897,700	$22,138,005	$26,421,000
	Container Recovery Fee	$3,777,060	$4,507,800	$7,905,784	$9,435,300
	Operating Income	$8,418,408	$10,047,100	$3,203,102	$3,822,800
	Total Operating Revenues	**$32,219,214**	**$38,452,600**	**$33,246,892**	**$39,679,100**
	Regulatory Transfers to BCMB	$145,375	$173,500	$86,052	$102,700
	Deposits Refunded to Depots	$16,093,520	$19,207,100	$16,947,837	$20,226,700
	Handling Commissions paid to Depots	$9,012,223	$10,755,800	$11,621,091	$13,869,400
	Transportation	$783,096	$934,600	$942,296	$1,124,600
	Processing	$667,550	$796,700	$1,370,209	$1,635,300
	Administration	$707,183	$844,000	$452,212	$539,700
	Advertising & System Development	$118,143	$141,000	$421,126	$502,600
	Total Operating Costs	**$27,527,090**	**$32,852,700**	**$31,840,821**	**$38,001,000**
	Excess of Revenues over Expenses	**$4,692,124**	**$5,599,900**	**$1,406,070**	**$1,678,100**

Norway vs. Alberta	Aluminum		Plastics	
	Norway	Alberta	**Norway**	Alberta
Demographic				
Population	4,593,041	3,223,415	4,593,041	3,223,415
Sales	198,900,000	478,279,000	61,900,000	320,199,586
Sales per Capita	43.30	148.38	13.48	99.34
Recovery per Capita	39.84	119.58	10.51	69.60
Recovery Statistics				
Recovery Mechanism	Retailers	Depot	Retailers	Depot
Recovery Rate	92%	80.6%	78%	70.1%
Units Recovered	182,988,000	385,454,619	48,282,000	224,338,585
Percent of Revenue Stream				
Deposits	76%	62%	80%	67%
Administrative Fee from Brandowners	13%		17%	
Container Recycling Fee		12%		24%
Other Operating Revenue	11%	26%	3%	10%
Percent of Cost Stream				
Deposit Refunds	68%	58%	66%	53%
Handling Commissions	12%	33%	8%	36%
Transportation	9%	3%	9%	3%
Processing	3%	2%	3%	4%
Administration, Advertising, System Development	9%	3%	13%	3%
Regulatory Transfers		0.5%		0.3%
Revenue per Container				
Deposits	$0.156	$0.062	$0.310	$0.118
Administrative Fee from Brandowners	$0.027		$0.066	
Container Recycling Fee		$0.012		$0.042
Other Operating Revenue	$0.024	$0.026	$0.010	$0.017
Total Revenue per Container Recovered	**$0.207**	**$0.100**	**$0.386**	**$0.177**
Total Revenue per Container w/o Deposits	**$0.050**	**$0.038**	**$0.076**	**$0.059**
Cost per Container				
Deposit Refunds	$0.142	$0.050	$0.245	$0.090
Handling Commissions	**$0.024**	**$0.028**	**$0.030**	**$0.062**
Transportation	$0.018	$0.002	$0.035	$0.005
Processing	$0.006	$0.002	$0.010	$0.007
Administration, Advertising, System Development	$0.019	$0.003	$0.049	$0.005
Regulatory Transfers	$0.000	$0.000	$0.000	$0.000
Total Cost per Container Recovered	**$0.209**	**$0.085**	**$0.369**	**$0.169**
Total Cost per Container w/o Refunds	**$0.067**	**$0.035**	**$0.124**	**$0.079**
Net Cost per Container Recovered				
Total Revenue per Container w/o Deposits	**$0.050**	**$0.038**	**$0.076**	**$0.059**
Total Cost per Container w/o Refunds	**$0.067**	**$0.035**	**$0.124**	**$0.079**
Net w/o Unredeemed Deposits	**($0.016)**	**$0.002**	**($0.048)**	**($0.020)**
Unredeemed Deposits per Container Recovered	**$0.014**	**$0.012**	**$0.065**	**$0.028**
Net Cost per Container Recovered	**($0.002)**	**$0.015**	**$0.017**	**$0.007**
Surplus of Revenue over Expenses (2004)	**($411,633)**	**$5,599,900**	**$812,637**	**$1,678,100**

Sweden vs. Alberta	Aluminum		Plastics	
	Sweden	Alberta	**Sweden**	Alberta
Demographic				
Population	9,001,774	3,223,415	9,001,774	3,223,415
Sales	914,000,000	478,279,000	365,000,000	320,199,586
Sales per Capita	101.54	148.38	40.55	99.34
Recovery per Capita	85.87	119.58	31.44	69.60
Recovery Statistics				
Recovery Mechanism	Retailers	Depot	Retailers	Depot
Recovery Rate	85%	80.6%	78%	70.1%
Units Recovered	773,000,000	385,454,619	283,000,000	224,338,585
Percent of Revenue Stream				
Deposits	78%	62%	70%	67%
Administrative Fee from Brandowners	0%		27%	
Container Recycling Fee		12%		24%
Other Operating Revenue	22%	26%	3%	10%
Percent of Cost Stream				
Deposit Refunds	59%	58%	58%	53%
Handling Commissions	28%	33%	35%	36%
Transportation	2%	3%	2%	3%
Processing	0%	2%	0%	4%
Administration, Advertising, System Development	11%	3%	5%	3%
Regulatory Transfers		0.5%		0.3%
Revenue per Container				
Deposits	$0.070	$0.062	$0.213	$0.118
Administrative Fee from Brandowners	$0.000		$0.082	
Container Recycling Fee		$0.012		$0.042
Other Operating Revenue	$0.020	$0.026	$0.009	$0.017
Total Revenue per Container Recovered	**$0.090**	**$0.100**	**$0.304**	**$0.177**
Total Revenue per Container w/o Deposits	**$0.020**	**$0.038**	**$0.091**	**$0.059**
Cost per Container				
Deposit Refunds	$0.053	$0.050	$0.171	$0.090
Handling Commissions	**$0.025**	**$0.028**	**$0.103**	**$0.062**
Transportation	$0.002	$0.002	$0.006	$0.005
Processing	$0.000	$0.002	$0.000	$0.007
Administration, Advertising, System Development	$0.010	$0.003	$0.015	$0.005
Regulatory Transfers	$0.000	$0.000	$0.000	$0.000
Total Cost per Container Recovered	**$0.090**	**$0.085**	**$0.295**	**$0.169**
Total Cost per Container w/o Refunds	**$0.037**	**$0.035**	**$0.124**	**$0.079**
Net Cost per Container Recovered				
Total Revenue per Container w/o Deposits	**$0.020**	**$0.038**	**$0.091**	**$0.059**
Total Cost per Container w/o Refunds	**$0.037**	**$0.035**	**$0.124**	**$0.079**
Net w/o Unredeemed Deposits	**($0.017)**	**$0.002**	**($0.033)**	**($0.020)**
Unredeemed Deposits per Container Recovered	**$0.017**	**$0.012**	**$0.041**	**$0.028**
Net Cost per Container Recovered	**$0.000**	**$0.015**	**$0.008**	**$0.007**
Surplus of Revenue over Expenses (2004)	**$0**	**$5,599,900**	**$2,386,936**	**$1,678,100**

APPENDIX F

PURCHASING POWER PARITY TABLE

APPENDIX F – PURCHASING POWER PARITY TABLE

Appendix F describes the purchasing power parity rates used in the study.

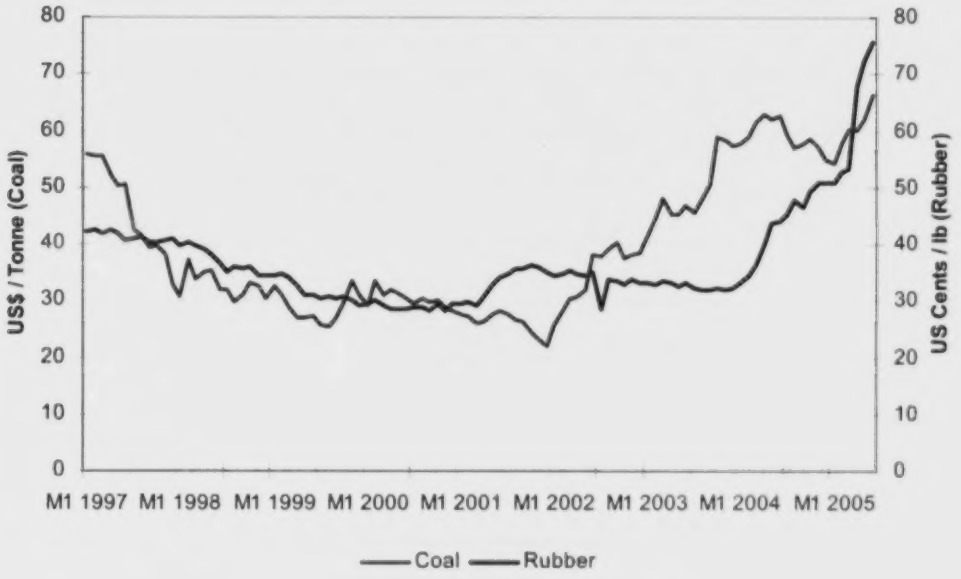
Country	Subject Description	Units	2001	2002	2003	2004	2005
Australia	PPP US dollar exchange rate	US dollars	1.360	1.375	1.404	1.432	1.437
Austria	PPP US dollar exchange rate	US dollars	0.907	0.912	0.910	0.911	0.907
Belgium	PPP US dollar exchange rate	US dollars	0.927	0.933	0.936	0.940	0.938
Canada	PPP US dollar exchange rate	US dollars	1.224	1.222	1.246	1.254	1.257
Cyprus	PPP US dollar exchange rate	US dollars	0.428	0.436	0.445	0.455	0.459
Denmark (DEK)	PPP US dollar exchange rate	US dollars	8.352	8.335	8.352	8.426	8.463
Finland	PPP US dollar exchange rate	US dollars	1.014	1.016	1.011	1.005	1.007
France	PPP US dollar exchange rate	US dollars	0.951	0.958	0.958	0.962	0.962
Germany	PPP US dollar exchange rate	US dollars	0.945	0.949	0.944	0.941	0.936
Greece	PPP US dollar exchange rate	US dollars	0.707	0.725	0.743	0.754	0.761
Hong Kong SAR	PPP US dollar exchange rate	US dollars	7.218	6.923	6.666	6.548	6.424
Iceland	PPP US dollar exchange rate	US dollars	89.178	92.627	93.016	93.803	94.970
Ireland	PPP US dollar exchange rate	US dollars	0.925	0.964	0.970	0.987	0.995
Israel	PPP US dollar exchange rate	US dollars	3.591	3.713	3.701	3.665	3.668
Italy	PPP US dollar exchange rate	US dollars	0.820	0.833	0.845	0.852	0.856
Japan	PPP US dollar exchange rate	US dollars	151.245	147.010	141.890	138.135	134.412
Korea	PPP US dollar exchange rate	US dollars	737.502	741.412	738.936	742.930	737.138
Luxembourg	PPP US dollar exchange rate	US dollars	0.842	0.840	0.846	0.854	0.854
Netherlands	PPP US dollar exchange rate	US dollars	0.966	0.987	1.005	1.012	1.016
New Zealand	PPP US dollar exchange rate	US dollars	1.581	1.563	1.546	1.557	1.566
Norway	PPP US dollar exchange rate	US dollars	9.072	8.851	8.915	8.731	8.642
Portugal	PPP US dollar exchange rate	US dollars	0.689	0.713	0.723	0.731	0.738
Singapore	PPP US dollar exchange rate	US dollars	1.604	1.588	1.571	1.571	1.568
Spain	PPP US dollar exchange rate	US dollars	0.773	0.798	0.818	0.837	0.847
Sweden (SEK)	PPP US dollar exchange rate	US dollars	9.708	9.725	9.808	9.882	9.931
Switzerland	PPP US dollar exchange rate	US dollars	2.008	1.993	1.963	1.951	1.932
Taiwan Province of China	PPP US dollar exchange rate	US dollars	19.308	18.906	18.545	18.444	18.339
United Kingdom	PPP US dollar exchange rate	US dollars	0.662	0.673	0.685	0.699	0.703
United States	PPP US dollar exchange rate	US dollars	1.023	1.023	1.028	1.033	1.032

APPENDIX G

HISTORICAL ENERGY PRICES

APPENDIX G – HISTORICAL ENERGY PRICES

Appendix G illustrates the correlation between global energy prices between 1997 and October 2005.



APPENDIX H

ERA ADVANCED DISPOSAL SURCHARGE RATES

APPENDIX H – ERA ADVANCED DISPOSAL SURCHARGE RATES

Product	Rate
Notebooks/Laptops	$5.00
Printers	$8.00
Computers	$10.00
Monitors	$12.00
Televisions Less than 19"	$15.00
Televisions between 19" and 29"	$25.00
Televisions between 30" and 44"	$30.00
Televisions 45" or greater	$45.00

APPENDIX I

CALIFORNIA ELECTRONIC WASTE RECYCLING FEE

APPENDIX I – CALIFORNIA ELECTRONIC WASTE RECYCLING FEE

Viewable Screen Size (measured diagonally)	Rate
Greater than 4" and less than 15"	$6.00
Equal to or greater than 15" and less than 35"	$8.00
35" or larger	$10.00

APPENDIX J

EL KRETSEN PRODUCT SURCHARGE RATES

APPENDIX J – EL KRETSEN PRODUCT SURCHARGE RATES

Product types and prices

VAT not included, 2005-08-01

NB The clacification follows the Swedish law SFS 2005:209.
New products/-categories have been red market.

1 Large household appliances		
102A	Microwave owns	25,00 SEK*
105A	Stoves full height (top and oven)	45,00 SEK*
106A	Dishwashers	45,00 SEK*
107A	Washing machines	45,00 SEK*
108A	Tumble dryers	45,00 SEK*
109A	Drying cabinets	45,00 SEK*
110A	Cooker hood ventilators	10,00 SEK*
111A	Mangles, ironing machines	25,00 SEK*
112A	Mini-kitchen ("Trinett." or such excl. refrigerators)	45,00 SEK*
113A	Separate stove tops or separate ovens	25,00 SEK*
115A	Portable refrigerators, air dehumidifiers	45,00 SEK
116A	Electric heaters, sauna units, small fans intended for fixed installation	4,00 SEK
140A	Refrigerators, cabinet and chest freezers	300,00 SEK*
2 Small household appliances		
101A	Vacuum cleaners, dry and wet cleaners	15,00 SEK*
103A	Sewing machines	5,00 SEK
104A	Small and medium sized household appliances, incl. radiators and fans not intended for fixed installation, air humidifiers, air cleaners. See product list below.	4,00 SEK*
114A	High-pressure sprayers for household use	6,50 SEK
601A	Electrical clocks and watches, clocks and watches containing batteries, small pulsmeters, pedometers etc.	0,20 SEK
602A	Clocks used for controlling equipment, (not permanently installed for controlling heating, refrigerating or air conditioning), analogous and digital time switches, timers, and timers for stoves, car-heaters etc. Small alarm systems for household (not fire detectors).	0,50 SEK
3 IT and telecommunications equipment		
201B-207B	ICT-products (computers, GPS, monitors, printers, scanners, copiers, other electrical or electronic office machines)	ICT-model
209B	UPS (battery backup)	0,50 SEK/kg
301B-303B	Telecom (fax machines, telephones connected to landline, telephone switchboards)	ICT-model
310A	Mobile telephones	0,20 SEK
311A	Cordless/portable telephones with base-unit connected to landline	0,50 SEK
321A	Modem, number identification devices, answering machines and phone accessories (for optic signals, doorbells, etc.)	0,50 SEK
331A	Small transformers and chargers sold separately	0,50 SEK
341A	Central antenna equipment (% of sale value preceding year. Only one, yearly report)	0,01 %
4 Consumer equipment		
401A	TV-sets (32 inches or larger) with or without built-in combinations	180,00 SEK
402A	TV- sets (smaller than 22 inches) with or without built-in combinations, door and surveillance videos	60,00 SEK
403A	Other appliances such as radio, video, CD or DVD players, loudspeakers, receivers, walkmans, tape recorders, amplifiers, clock radios, digital TV-boxes, music instruments	7,00 SEK
404A	TV-sets (22-31 inches) with or without built-in combinations	120,00 SEK
405A	TV- sets (6 inches or smaller)	8,00 SEK
420A	Audio, lighting and visual equipment for professional use (Total sales volume preceding year. Only one, yearly report)	0,40 SEK/kg
501A	Cameras, video cameras, film- and photographic copying equipment, still-picture projectors	1,00 SEK

* Incl. finacial guarantee

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5 Lighting equipment

801A	Fittings for light sources for professional use, over 2 kg (excl. light	5,00 SEK
8011A	Torches, headlamps and bicycle lamps not recharging over 2 kg (excl. batteries)	5,00 SEK
802A	Fittings for light sources for professional use, under 2 kg (excl. light	2,00 SEK
8021A	Torches, headlamps and bicycle lamps not recharging 1-2 kg (excl. batteries)	2,00 SEK
803A	Fittings for light sources for home use, % of sales value (excl. light	0,5 %
810A	Straight fluorescent tubes	1,90 SEK
811A	Fluorescent light bulbs	1,90 SEK
812A	Light bulbs	0,06 SEK
813C	Small light bulbs (Low-voltage halogen, from vehicles, Christmas-light chains, bicycle- and torches). Yearly cost per company.	2.500 SEK per year
814C	Photographic light bulbs, rechargeable light bulbs (studio, TV, projector etc.) Yearly cost per company selling such products.	5.000 SEK per year
821A	Equipment for controlling light (light switches, light relays, IR-detectors for lighting)	0,50 SEK

6 Electrical and electronic tools

120A	Electrical hand tools (screw, drill, polish, saw, weld, spray)	2,00 SEK
130A	Electrical appliances for cutting grass or gardening	6,50 SEK

7 Toys, leisure and sports equipment

701A	Video games for connection to TV-sets, small equipment for sport and leisure	4,00 SEK
702A	Electrical games and toys, Battery-driven games and toys. % of import/sales value	0,17 %

8 Medical devices

901A	Medical Equipment (Sales volume preceding year. Only one, yearly report)	2,00 SEK/kg
902A	Hearing aids and equipment (Sales volume preceding year. Only one, yearly report)	0,20 SEK
1001A	Laboratory Equipment (Sales volume preceding year. Only one, yearly report)	2,00 SEK/kg

9 Monitoring and control instruments

903A	Fire detector, optical	12,50 SEK
904A	Fire detector, jonizing (radioactive)	37,50 SEK

(NB! For the time being El-Kretsen does not handle smoke detectors.

10 Monitoring and control instruments

For the time being El-Kretsen does not handle automatic dispensers (money- or goods-) for professional use.

11 Other

1101A	Small electrical appliances under 100 grams (not containing built-in batteries or other environmentally hazardous components)	1,00 SEK
1102	As above (1101A) but over 100 grams	2,00 SEK
1103	Torches, headlamps and bicyle lamps not recharging under 1 kg (excl. batteries)	0,20 SEK
1104	Rechargeable electrical torches and bicycle lights incl. charger.	4,00 SEK
1100A	Products, not in any group above, 0,50 % of sales value (unless there is special reasons for a lower or higher fee or other debiting model)	0,50 %

APPENDIX K

SWICO ADVANCED RECYCLING FEE RATES

APPENDIX K – SWICO ADVANCED RECYCLING FEE RATES

ARF tariff from 1st January 2006 for products up to CHF 6'000.00

sales price (excl. VAT)

alphabetical overview print

	ARF incl. VAT
ARF excl. VAT 0.00	0.00
All items with a sales price below CHF 50.00	

	ARF incl. VAT
ARF excl. VAT 0.93	1.00
PC/server components, cameras, portable equipment (in part)	
Cameras such as:	
Analogue camera, Compact camera, Digital camera, Webcam	
PC/server and similar components, such as:	
Bluetooth, Drive (DVD, CD-Rom), Firewall card, Graphic card, Graphic pad, Hard disk, Main adapter, Motherboard, Mouse, Network interface card, PC card (not memory), PC keyboard, PCI plug-in card, Processor, RAM/main memory (in any form), Radio component audio/video, SCSII plug-in card, Sound card, USB hub/port, USB plug-in card	
Various items such as:	
Charging set, Control equipment for game console, Hand measuring equipment, Headphone with/without microphones (handsfree set), Hi-Fi component (vehicle), Keyboard instrument for children (electronic), Loudspeaker small (pairs), MP3/4 player, Measuring transmitter, Microphone, Portable equipment (radio, audiotape, MD), Portable game console (PSP, etc.), Remote control, USB telephone	

	ARF incl. VAT

	ARF excl. VAT 1.86	2.00
Portable equipment (in part), car consumer electronics, network products (in part)		
Consumer electronics, car consumer electronics such as:		
Camcorder, Car radio, Loudspeaker system (car loudspeaker), Mobile navigation equipment, Radio recorder (portable)		
IT equipment such as:		
Card drive, External drive, External hard disk drive, Handheld, PDA/Organizer, Pocket-PC, Stationary game console (X-Box, PS etc.), USB storage multifunctional (without HDD)		
Network products that are not suitable for racks such as:		
KVM Switch, Modem, Module, Router, Switch, Webserver, Wireless Modem, Wireless antenna, Wireless control equipment		
Office equipment such as:		
Access device, Barcode reading device, Letter and package scale, Lettering equipment, Printer for addressing system, Printer for till system, Table calculator, Translation equipment		

		ARF incl. VAT
	ARF excl. VAT 4.18	4.50
Printers, office equipment, large loudspeakers, audio Hi-Fi components, tills and scales (in part)		
Audio and hi-fi components such as:		
Built-in combi equipment (GPS with radio/CD and/or DVD), DVD, Large loudspeaker (pairs), Microsystem, Multiformat video player, SAT receiver, Surround system without DVD (home cinema), VCR		
IT equipment such as:		
Alarm system, Electronic document camera, Media center (portable), On board computer (vehicle)		
Office equipment such as:		
Binding system, Daylight projector, Dictating machine, Laminating equipment, Letter opener		
Printers* such as:		
Ink jet printer Basic function, Photographic printer, Scanner		
Tills and scales such as:		
Scale (shop scale) without printing unit, Till without printing unit		

Various, such as:
AC/DC Adapter, Stationary measuring equipment

ARF incl. VAT

ARF excl. VAT 5.58

6.00

Printers, office equipment, network products (in part), tills and scales

Network products suitable for racks such as:
External power source, Router, Switch, Wireless equipment
Office equipment such as:
Cutting machine, Shredders with feed up to 240 mm
Printer* / copying machines* such as:
Basic function laser printer, Fax machine, Multi-function ink jet printer, Small copier
Tills and scales such as:
Shop scale with printing unit, Till with internal printing unit, Touchscreen till
Various items such as:
Industrial terminals not programmable

ARF incl. VAT

ARF excl. VAT 8.36

9.00

Computers, printers/copiers, monitors, TVs, audio/DVD, UPSs (in part), office equipment

Audio / DVD such as:
Audio/DVD system with loudspeaker, Car system with monitor, Keyboard (audio/acoustic system), Mini-Midi system, Projector, Surround system with DVD (home cinema), Video projector
Computers / workstations such as:
Laptop, PC, Portable PC, Server
Monitors / TVs such as:
Monitor with diagonal screen size up to 23", TV with diagonal screen size up to 65 cm

Office equipment such as:
Seam folding machine, Envelope machine, Shredders with feed from 240 mm
Printers*/ copiers* such as:
Multi-function copier, Multi-function laser printer
UPSs such as:
Programmable UPS system, up to 1'500 voltampere power
Various items such as:
Electronic whiteboard , Programmable industrial terminal

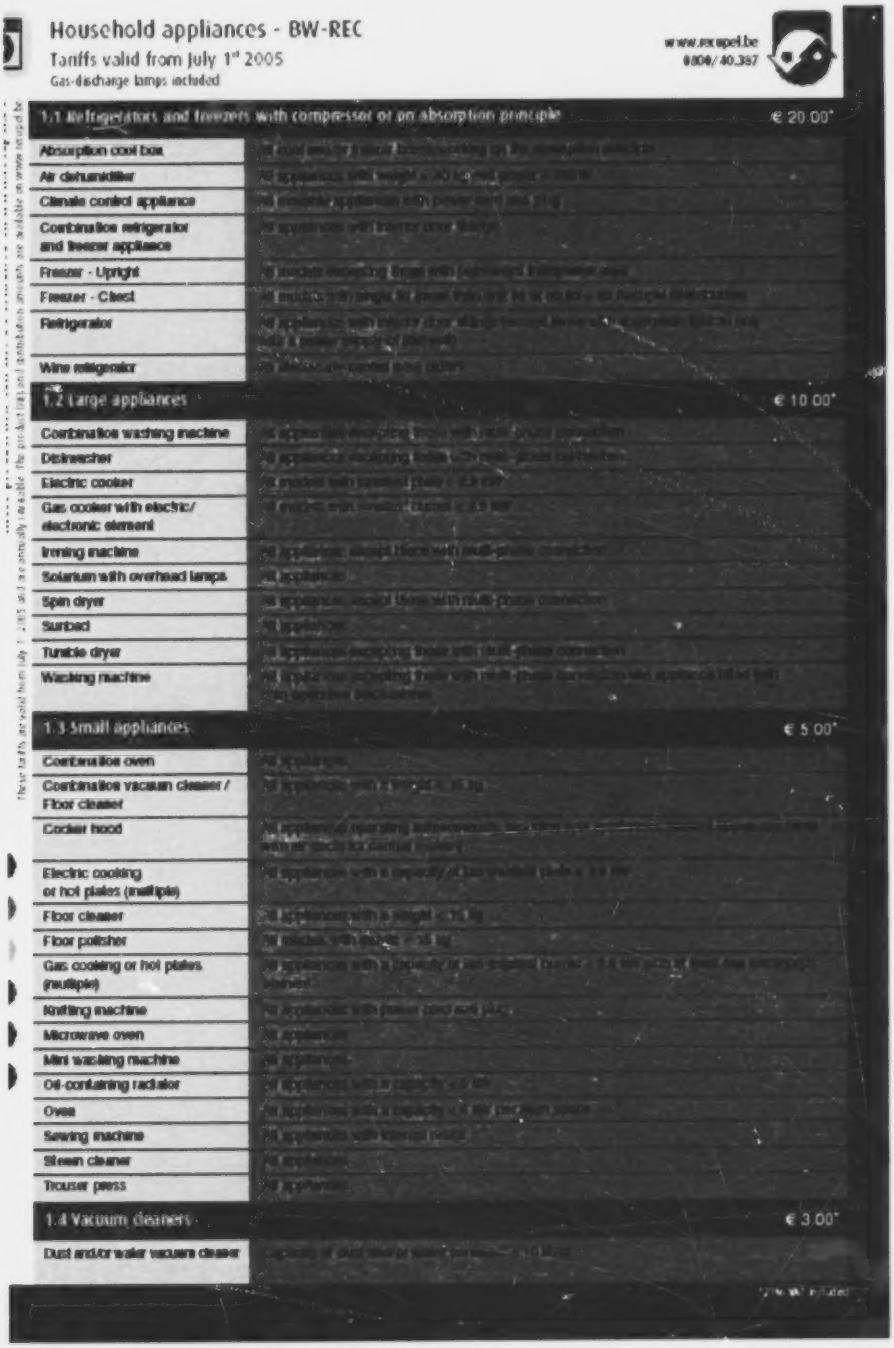
	ARF incl. VAT
ARF excl. VAT 16.73	18.00
Monitors, TVs, UPSs	
Monitors / TVs such as:	
Monitor with screen size from 23" , TV with diagonal screen size from 65 cm including back projector	
UPSs such as:	
Pluggable UPS systems from 1'500 voltampere power	

*** including expendable items such as ink, colours and toner during the entire service life of the equipment**

APPENDIX L

SAMPLE RECUPEL PRODUCT RECYCLING FEE RATES

APPENDIX L – SAMPLE RECUPEL PRODUCT RECYCLING FEE RATES



Household appliances - BW-REC

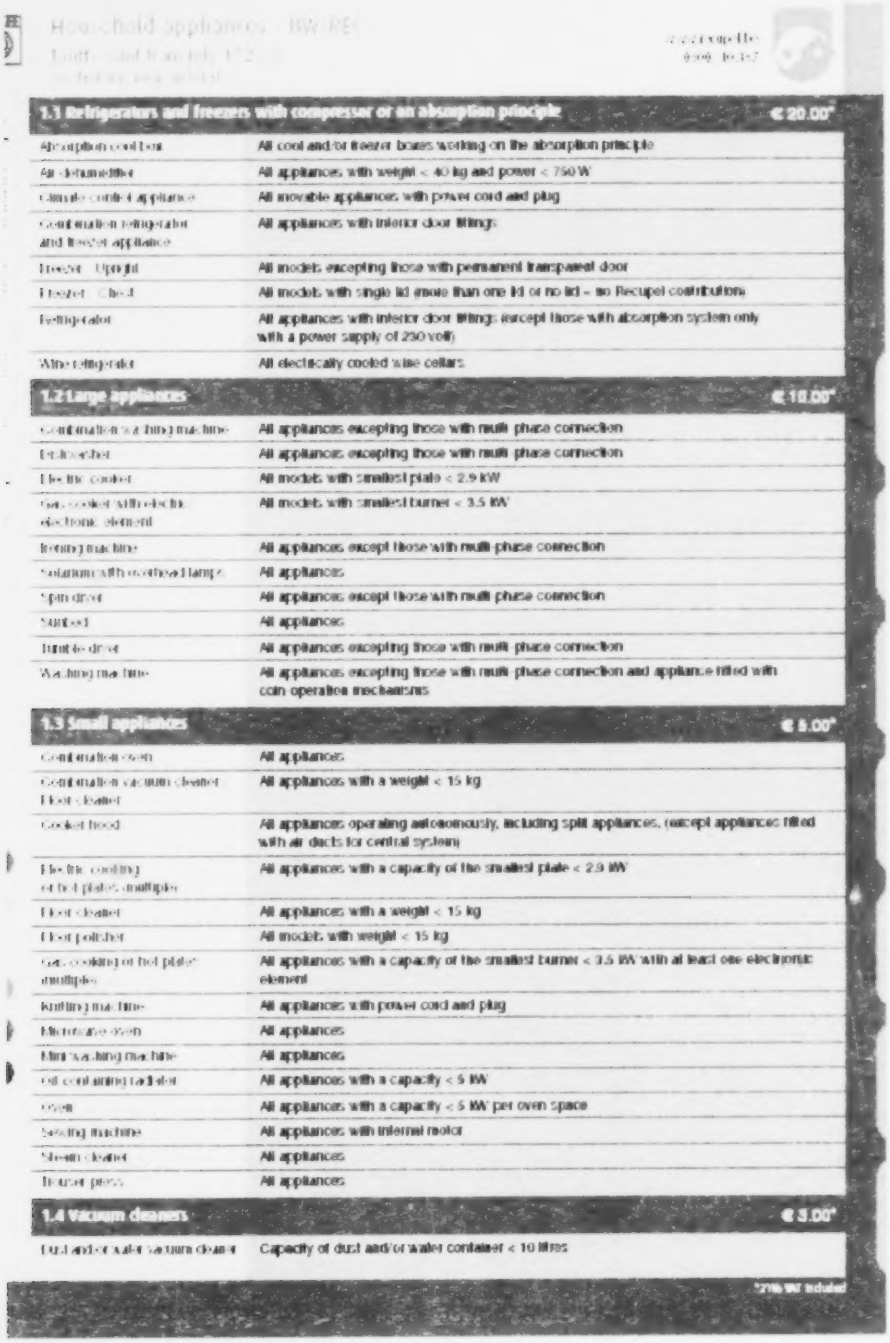
Tariffs valid from July 1st 2005

Gas-discharge lamps included

www.recupel.be
0800/40.397

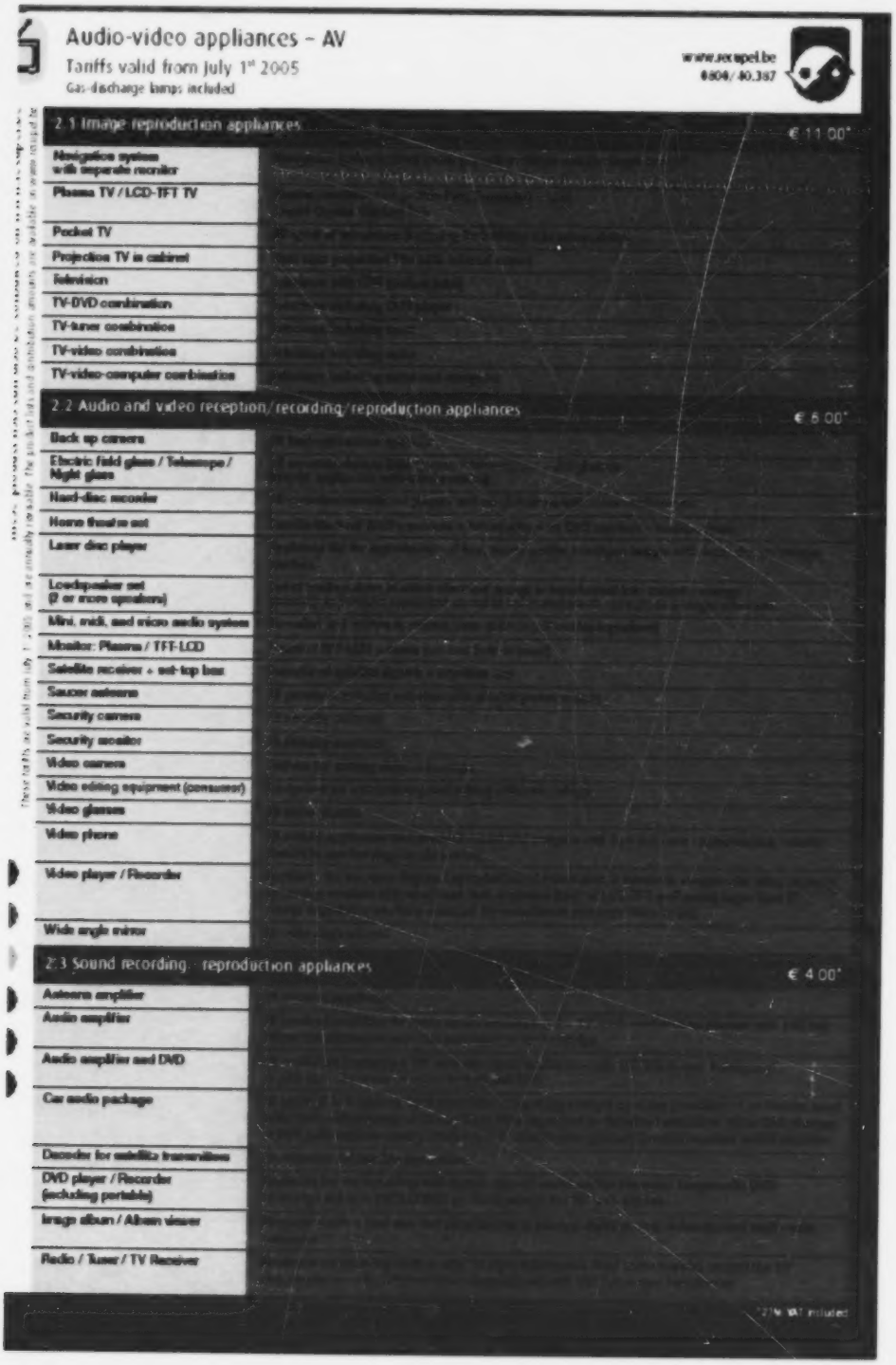
1.1 Refrigerators and freezers with compressor or on absorption principle	€ 20.00*
Absorption cool box	
Air dehumidifier	
Climate control appliance	
Combination refrigerator and freezer appliance	
Freezer - Upright	
Freezer - Chest	
Refrigerator	
Wine refrigerator	
1.2 Large appliances	€ 10.00*
Combination washing machine	
Dishwasher	
Electric cooker	
Gas cooker with electric/ electronic element	
Ironing machine	
Solarium with overhead lamps	
Spin dryer	
Sunbed	
Tumble dryer	
Washing machine	
1.3 Small appliances	€ 5.00*
Combination oven	
Combination vacuum cleaner / Floor cleaner	
Cooker hood	
Electric cooking or hot plates (multiple)	
Floor cleaner	
Floor polisher	
Gas cooking or hot plates (multiple)	
Knitting machine	
Microwave oven	
Mini washing machine	
Oil-containing radiator	
Oven	
Sewing machine	
Steam cleaner	
Trouser press	
1.4 Vacuum cleaners	€ 3.00*
Dust and/or water vacuum cleaner	

APPENDIX L – SAMPLE RECUPEL PRODUCT RECYCLING FEE RATES



1.1 Refrigerators and freezers with compressor or an absorption principle	€ 20.00*
Absorption cool box	All cool and/or freezer boxes working on the absorption principle
Air-conditioner	All appliances with weight < 40 kg and power < 750 W
Climate control appliance	All movable appliances with power cord and plug
Combination refrigerator and freezer appliance	All appliances with interior door fittings
Freezer - Upright	All models excepting those with permanent transparent door
Freezer - Chest	All models with single lid (more than one lid or no lid – no Recupel contribution)
Refrigerator	All appliances with interior door fittings; except those with absorption system only with a power supply of 230 volt)
Wine refrigerator	All electrically cooled wine cellars
1.2 Large appliances	**€ 10.00***
Combination washing machine	All appliances excepting those with multi phase connection
Dishwasher	All appliances excepting those with multi phase connection
Electric cooker	All models with smallest plate < 2.9 kW
Gas cooker with electric electronic element	All models with smallest burner < 3.5 kW
Ironing machine	All appliances except those with multi phase connection
Solarium with overhead lamps	All appliances
Spin dryer	All appliances except those with multi phase connection
Sunbed	All appliances
Tumble dryer	All appliances excepting those with multi phase connection
Washing machine	All appliances excepting those with multi phase connection and appliance fitted with coin operation mechanisms
1.3 Small appliances	**€ 5.00***
Combination oven	All appliances
Combination vacuum cleaner / floor cleaner	All appliances with a weight < 15 kg
Cooker hood	All appliances operating autonomously, including split appliances, (except appliances fitted with air ducts for central system)
Electric cooking on hot plate / multiplate	All appliances with a capacity of the smallest plate < 2.9 kW
Floor cleaner	All appliances with a weight < 15 kg
Floor polisher	All models with weight < 15 kg
Gas cooking on hot plate / multiplate	All appliances with a capacity of the smallest burner < 3.5 kW with at least one electronic element
Knitting machine	All appliances with power cord and plug
Microwave oven	All appliances
Mini washing machine	All appliances
Oil combating cartridge	All appliances with a capacity < 5 kW
Oven	All appliances with a capacity < 5 kW per oven space
Sewing machine	All appliances with internal motor
Steam cleaner	All appliances
Trouser press	All appliances
1.4 Vacuum cleaners	**€ 3.00***
Dust and/or water vacuum cleaner	Capacity of dust and/or water container < 10 litres

*Prices VAT included



Audio-video appliances - AV

Tariffs valid from July 1st 2005

Gas-discharge lamps included

www.recupel.be
0800/ 40.367

2.1 Image reproduction appliances — € 11.00*

- Navigation system with separate receiver
- Plasma TV / LCD-TFT TV
- Pocket TV
- Projection TV in cabinet
- Television
- TV-DVD combination
- TV-tuner combination
- TV-video combination
- TV-video-computer combination

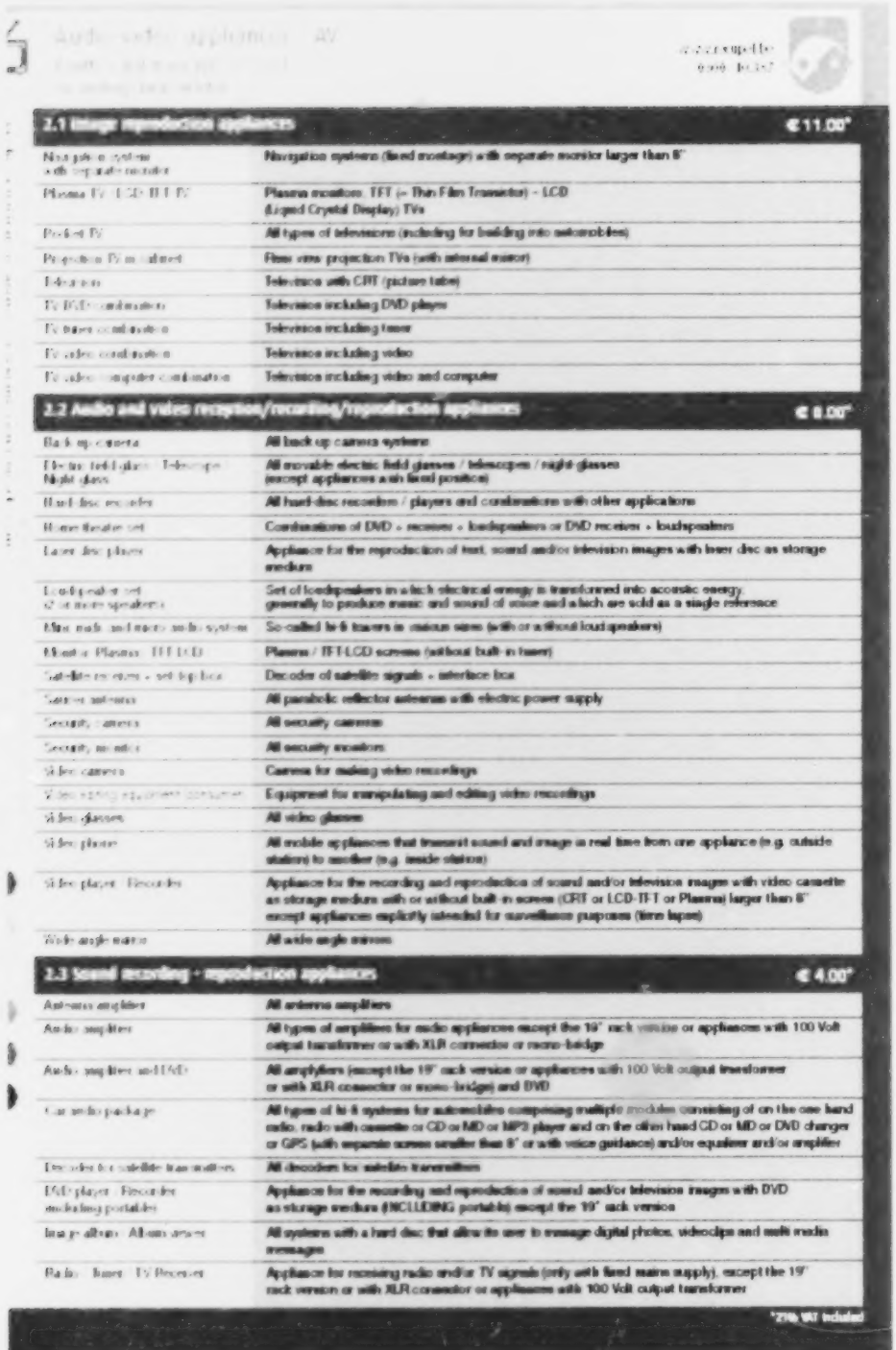
2.2 Audio and video reception/recording/reproduction appliances — € 8.00*

- Back up camera
- Electric field glass / Telescope / Night glass
- Hard-disc recorder
- Home theatre set
- Laser disc player
- Loudspeaker set (2 or more speakers)
- Mini, midi, and micro audio system
- Monitor: Plasma / TFT-LCD
- Satellite receiver + set-top box
- Saucer antenna
- Security camera
- Security monitor
- Video camera
- Video editing equipment (consumer)
- Video glasses
- Video phone
- Video player / Recorder
- Wide angle mirror

2.3 Sound recording- reproduction appliances — € 4.00*

- Antenna amplifier
- Audio amplifier
- Audio amplifier and DVD
- Car audio package
- Decoder for satellite transmitters
- DVD player / Recorder (excluding portable)
- Image album / Album viewer
- Radio / Tuner / TV Receiver

*VAT included



2.1 Image reproduction appliances	€ 11.00*
Navigation system with separate monitor	Navigation systems (fixed mountage) with separate monitor larger than 8"
Plasma TV / LCD TFT TV	Plasma monitors, TFT (= Thin Film Transistor) - LCD (Liquid Crystal Display) TVs
Pocket TV	All types of televisions (including for building into automobiles)
Projection TV monitors	Rear view projection TVs (with internal mirror)
Television	Televisions with CRT (picture tube)
TV DVD combinations	Televisions including DVD player
TV tuner combinations	Televisions including tuner
TV video combinations	Televisions including video
TV video computer combinations	Televisions including video and computer

2.2 Audio and video reception/recording/reproduction appliances	€ 8.00*
Back up cameras	All back up camera systems
Electric field glasses - Telescopes - Night glasses	All movable electric field glasses / telescopes / night glasses (except appliances with fixed position)
Hard disc recorders	All hard-disc recorders / players and combinations with other applications
Home theater set	Combinations of DVD + receiver + loudspeakers or DVD receiver + loudspeakers
Laser disc players	Appliance for the reproduction of text, sound and/or television images with laser disc as storage medium
Loudspeaker set (2 or more speakers)	Set of loudspeakers in which electrical energy is transformed into acoustic energy, generally to produce music and sound of voice and which are sold as a single reference
Mini audio and micro audio systems	So-called hi-fi towers in micro sizes (with or without loudspeakers)
Monitor Plasma - TFT LCD	Plasma / TFT-LCD screens (without built-in tuner)
Satellite receiver + set top box	Decoder of satellite signals + interface box
Satellite antennas	All parabolic reflector antennas with electric power supply
Security cameras	All security cameras
Security monitors	All security monitors
Video cameras	Cameras for making video recordings
Video editing equipment computer	Equipment for manipulating and editing video recordings
Video glasses	All video glasses
Video phones	All mobile appliances that transmit sound and image in real time from one appliance (e.g. outside station) to another (e.g. inside station)
Video players - Recorders	Appliance for the recording and reproduction of sound and/or television images with video cassette as storage medium with or without built-in screen (CRT or LCD-TFT or Plasma) larger than 8" except appliances explicitly intended for surveillance purposes (time lapse)
Wide angle mirrors	All wide angle mirrors

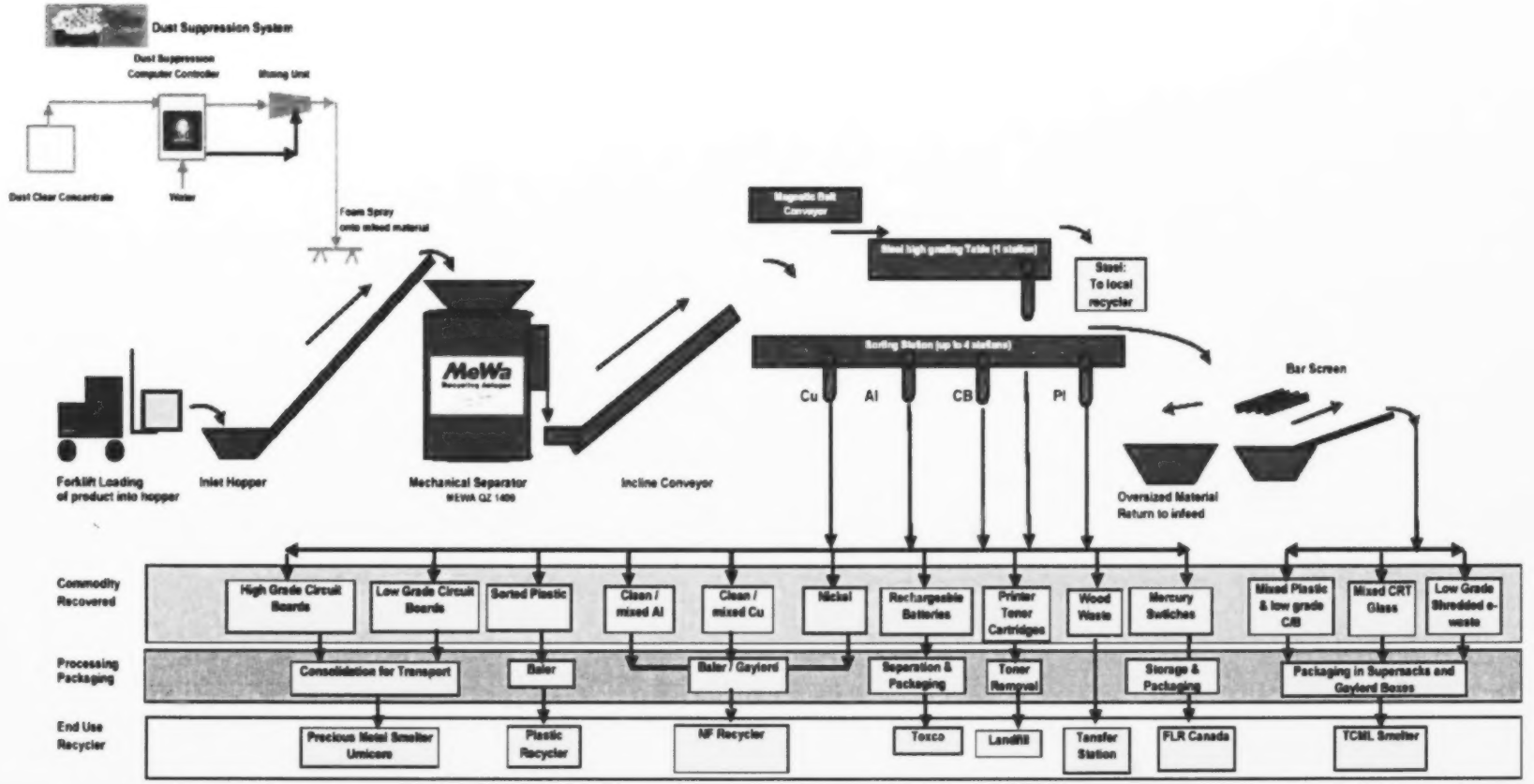
2.3 Sound recording + reproduction appliances	€ 4.00*
Antennas amplifier	All antenna amplifiers
Audio amplifier	All types of amplifiers for audio appliances except the 19" rack version or appliances with 100 Volt output transformer or with XLR connector or mono-bridge
Audio amplifier with DVD	All amplifiers (except the 19" rack version or appliances with 100 Volt output transformer or with XLR connector or mono-bridge) and DVD
Car audio package	All types of hi-fi systems for automobiles composing multiple modules consisting of on the one hand radio, radio with cassette or CD or MD or MP3 player and on the other hand CD or MD or DVD changer or GPS (with separate screen smaller than 8" or with voice guidance) and/or equalizer and/or amplifier
Decoders for satellite transmitters	All decoders for satellite transmitters
DVD player - Recorder excluding portables	Appliance for the recording and reproduction of sound and/or television images with DVD as storage medium (INCLUDING portable) except the 19" rack version
Image albums - Album viewer	All systems with a hard disc that allow its user to manage digital photos, videoclips and multi media messages
Radio - Tuner - TV Receiver	Appliance for receiving radio and/or TV signals (only with fixed mains supply), except the 19" rack version or with XLR connector or appliances with 100 Volt output transformer

*21% VAT included

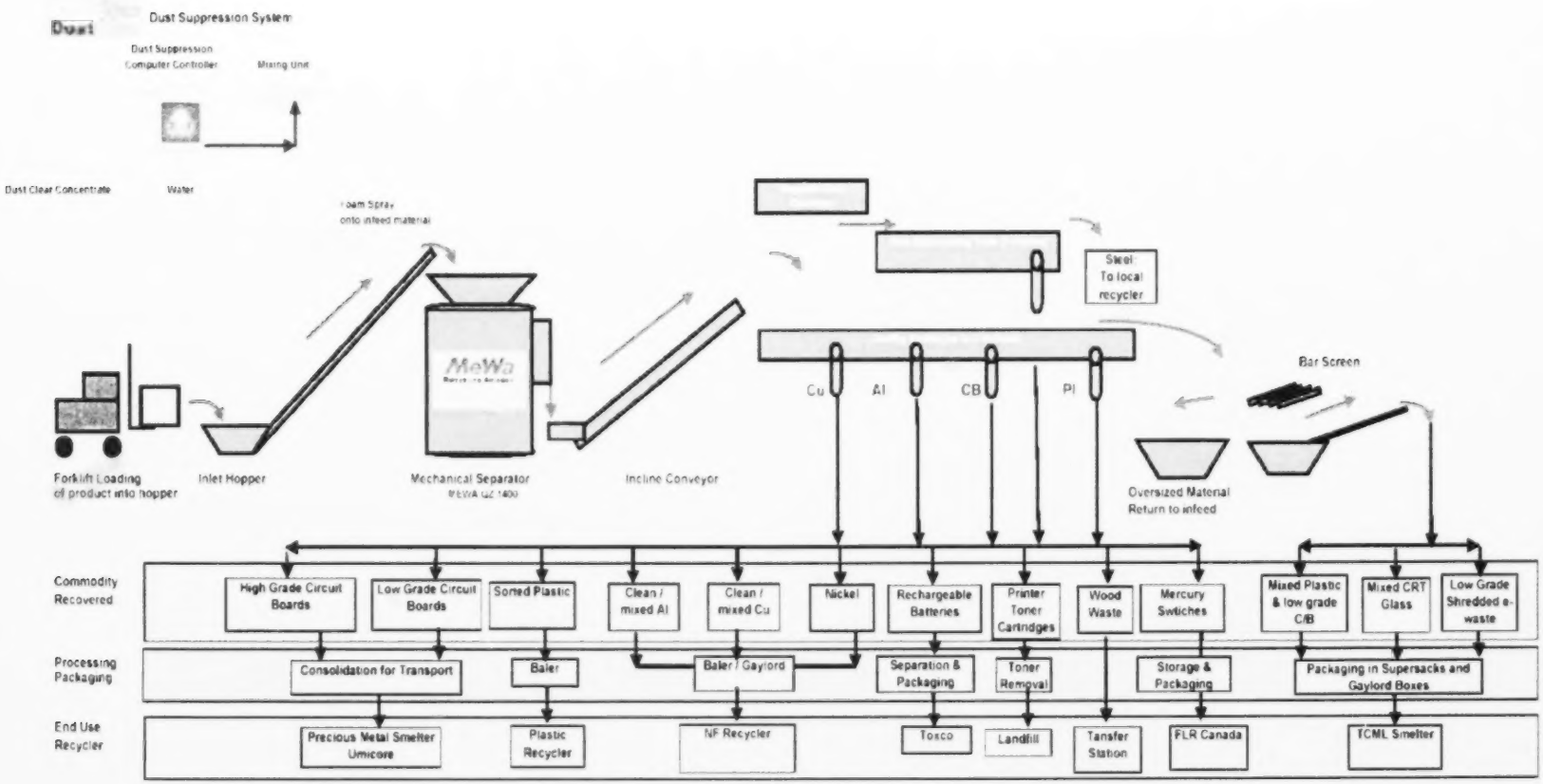
APPENDIX M

ECYCLE SOLUTIONS RECYCLE PROCESS

APPENDIX M – ECYCLE SOLUTIONS RECYCLE PROCESS



APPENDIX M – ECYCLE SOLUTIONS RECYCLE PROCESS



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